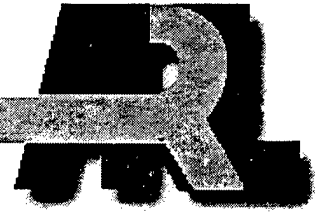


ARMY RESEARCH LABORATORY



Defining Training Objectives and Performance Measures in a Janus Battle Simulation

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AUGUST 1998

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under contract

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Army Research Laboratory

Aberdeen Proving Ground, MD 21005-5425

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Abstract

The United States Army Field Artillery School (USAFAS) at Fort Sill, Oklahoma, uses the Janus battle simulation for training officers in fire support operations and battle command decision making. In conjunction with the training exercises, a series of experiments was run to determine the effectiveness of the Janus simulation for training students in the Officer Basic Course (OBC). Course instructors were interviewed to determine the training objectives expected to be met using the Janus simulation. These objectives were measured using both objective and subjective measurement approaches. Objective measures were performance indicators that could be derived from the simulation. Characteristics of the simulation, instructor involvement, and ability of the interactors limited the validity of the objective measures. Subjective measures, obtained using self-report measures from instructors and students, indicated that the Janus simulation exercises, as used in the OBC, were useful in increasing the confidence and proficiency of the students. Results are presented by training objective and measurement approach.

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EXECUTIVE SUMMARY

The purpose of this study was to determine the extent to which the Janus Battle Simulation System exercises help train the Officer Basic Course (OBC) students. In Study 1, OBC and Officer Advanced Course (OAC) instructors were interviewed, and 16 objectives were identified, which OBC students should master through their experiences with the Janus Battle Simulation System exercises. In Study 2, six of these objectives were examined: (1) increase confidence in students' ability to execute fire support, (2) increase students' knowledge of fire support techniques, (3) successfully perform battle tracking, (4) successfully establish and use trigger points, (5) successfully engage high "payoff" targets, and (6) successfully update information. Objective measures to determine the success of students in meeting most of the objectives were developed and examined during 18 defensive and 18 offensive OBC battles. Comparisons were made between the students' first and second battles of the day (or before the first battle and after the second battle) and between the defensive and offensive exercises. Study 3 was conducted to develop and evaluate subjective measures of performance. Instructors and students rated their perceived performance in meeting nine objectives.

Study 2 Objectives

Increase Confidence

A 14-item paper-and-pencil test was administered before the first battle and after the second after-action review (AAR) during the defensive and offensive exercises. OBC students were asked to rate their proficiency at performing various tasks on a five-point Likert scale. Results indicated that students were more confident after the second AAR than before the first battle, and students performing their second exercise (i.e., the offensive exercise) were more confident than those performing their first exercise (i.e., the defensive exercise). Thus, the Janus Battle Simulation System exercises do positively affect the officers' self-reported perceptions of proficiency.

Increase Knowledge

A 12-item paper-and-pencil multiple choice test was administered along with the proficiency test. Although performance did not improve with each Janus experience, students' performance on the test was quite high (about 75% correct). Among students performing the defensive exercise, scores were higher after the second exercise than before the first. However,

many instructors later indicated that some of the questions on the multiple choice test covered material not focused on during the course.

Perform Battle Tracking

The classes' efficiency of spot reporting tended to improve with each Janus experience. Spot reporting was measured by the ratio of the number of grid locations of enemy elements that were reported to the task force fire support officer (TF FSO) by a team or company fire support officer (Co FSO) and the total number of identified enemy elements. For example, students were more efficient during the first offensive battle than during the second defensive battle and more efficient during the second defensive battle than during the first defensive battle. (Students perform the defensive battles before the offensive battles.) However, students' efficiency during the last battle (i.e., the second offensive battle) was not superior to the performance of prior battles. This measure is confounded by the use of close air support (CAS). CAS is employed more often during the second battles relative to the first battles, and when CAS is used, students cannot see the enemy icons, which are revealed with the Janus battle replay, thus artificially lowering students' perceived performance of this measure. In addition, prompts by instructors and the ability of the simulation interactor may artificially affect this measure.

The time required by the company FSO or team to report grid locations of enemy elements to various officers (e.g., TF FSO, direct support artillery [DS Arty]) did not improve with each Janus experience. Instructors indicated that the times were shorter than expected. Instructors concluded that students performed their spot reporting in a timely manner. However, prompting by instructors also confounds these measures.

Ratios between the number of times "shot" was reported from the fire direction center (FDC) to the team or company FSO and the number of fire missions, repeats, and adjust fires were formed. Both measures were obtained from examining the communication transcripts. Analyses revealed that students were better at calling "shot" during the offensive exercise than during the defensive exercise. However, this measure is confounded by simulation interactor ability.

Establish and Use Trigger Points

Objective measures of the success of students in establishing and using trigger points were not defined. Future studies may rely on the instructor's (or simulation interactor's) perceptions of the students' skill in using trigger points.

Engage High "Payoff" Targets

Since only 1 of the 18 offensive groups and 2 of the 18 defensive groups actually reported a high payoff target (HPT) in both the first and second battle, this measure could not be analyzed. In addition, several instructors later indicated that this is not emphasized in the OBC classes.

Update Information

Although there were problems with the measure designed for updating information, groups performing the offensive exercises performed better than those performing the defensive exercises, and students performed better during their second battle of the day than during their first. Success was measured with the ratio between the number of times effects were reported to the team of TF FSO and the number of fire missions, repeats, and adjust fires. Artifacts of Janus and differences between scenarios may account for the performance difference.

Correlations With Janus Analyst Work Station (JAWS)

Measures were correlated with several outcome measures commonly used when examining a Janus exercise, specifically, the force exchange ratio (FER), surviving maneuver force ratio differential (SMFRD), change in combat ratio (Δ CR), and the command and control index of lethality levels. No significant correlations were found. Thus, performance in meeting the objectives identified by instructors is not predictive of battle outcome. The focus of the training exercise is on the process of battle command, not on battle outcome. Thus, this result was expected.

Conclusions of Study 2

In summary, the measures of performance of six identified objectives of the OBC exercises were examined while OBC students performed 18 defensive and 18 offensive battles. Measures taken before or during the students' first battle with Janus were compared to measures taken after or during the students' second battle with Janus, and offensive exercise performance was compared with defensive exercise performance. Survey results indicated that students' confidence significantly increased from before the Janus exercise began to after the second AAR and from the defensive to the offensive exercise. Performance measures indicated that the officers were successful at battle tracking, improved their efficiency of spot reporting and updating information from their first to second Janus experience, and demonstrated a high degree of

proficiency at accurately reporting the grid locations of enemy elements and reporting the locations in a timely manner. Consistent with instructors' hypotheses, correlational analyses revealed weak relationships between process and outcome variables.

Many of the objective measures proved to be problematic for many reasons. First, some of the performance measures were artificially inflated or deflated because of the simulation characteristics. If the developers of future versions of Janus work closely with instructors and researchers in order to diminish these "side effects," then as the Janus program evolves, many of these characteristics will be eliminated.

Second, instructor variability makes it nearly impossible to examine performance. Some instructors take a much more active role than others; some allow their officers to make mistakes; others intervene. This variability must be removed in order for researchers to measure and compare students' performance. One way to achieve this goal is to provide instructors with a training program that specifies the activities that are deemed appropriate for instructors. For example, the program should identify the appropriate level of intervention to be made by instructors.

Study 3

In addition to increasing our knowledge of how the Janus experience affects students' confidence and proficiency, the results of Study 2 illuminated the difficulty in measuring the objectives instructors have for their students. Although the instructors are most knowledgeable about what they wish the officers to learn, they are not well informed about how the Janus system operates. Thus, many of the measures that were generated and used were flawed because of Janus artifacts. Also, many of the people who are experts in the Janus system are not well informed about what the instructors want the officers to learn and therefore do not strive to minimize confounds such as instructor or even interactor coaching. A mastery of both areas is needed in order to generate valid measures of the training objectives. In addition, the variation introduced by differences in ability and style of the instructors proved to create problems in measuring some of the objectives. Thus, in Study 3, we relied primarily on subjective measures to assess the objectives.

Since many of the objective measures proved to be problematic, Study 3 was designed to develop subjective measures for the nine objectives identified as "most important" in Study 1: (1) develop and execute a company fire support plan, (2) prepare and deliver a company fire support briefing, (3) effectively plan and execute trigger points, (4) build confidence in students'

abilities to plan and execute fire support, (5) experience students' role as a company fire support officer, (6) effectively use priority of fires and the clearance of fires, (7) gain "real time" experience in planning, coordinating, and executing fire support in conjunction with maneuver forces, (8) gain experience and appreciation for the command, control, and coordination relationships between the company commander, the company FSO, and the battalion FSO, and (9) develop and use the fire support execution matrix. Students rated the proficiency with which they achieved many of the objectives before the first battle of the day and after the second AAR of the day; instructors rated the proficiency of the students playing company FSOs during the first and second battles of the day. As in Study 2, performance changes between the first and second battles of the day and between the offensive and defensive exercises were examined.

The self-report measures led to a clear pattern of results. For most measures, instructors believed that the officers' proficiency increased from the morning battle to the afternoon battle. Likewise, the officers tended to rate their performance more favorably during the afternoon battle than the morning battle. In addition, the officers rated their performances during the offensive exercises more favorably than during the defensive exercises. Specifically, the officers rated their proficiency at meeting the nine objectives more favorably with each Janus experience. Before the first experience with Janus, students' confidence levels were often at their lowest. After participating in two battles and two defensive AARs, the confidence ratings of the students increased to a moderate level. About 3 weeks later, when the officers knew they were about to perform two offensive exercises, their confidence level had not changed from the moderate level. After the two additional battles and two offensive AARs, the students' rating of the proficiency reached its highest level. Thus, it appears that the Janus experience provides the basic course students with the skills and experience that the instructors deem important.

Conclusions

Results from the three studies indicate that (1) Janus training objectives for United States Army Field Artillery School (USAFAS) OBC students can be identified and agreed upon by course instructors; (2) objective measures of student performance may be artificial because of simulation characteristics and are skewed because of instructor involvement and simulator interactor ability; (3) outcome measures such as force exchange ratios (FERs) are not predictive of the process of student battle command performance; and (4) subjective ratings by instructors and students are similar and indicate that officers' proficiency increases with each Janus experience.

DEFINING TRAINING OBJECTIVES AND PERFORMANCE MEASURES IN A JANUS BATTLE SIMULATION

The Janus Battle Simulation Center (JBSC) located at Fort Sill, Oklahoma, provides a training environment as well as research opportunities for personnel associated with the United States Army Field Artillery School (USAFAS) and Fort Sill. Janus is a two-sided, interactive ground combat simulation that can portray different types of battlefield situations. Students enrolled in the Officer Basic Course (OBC) are given two opportunities to apply what they have learned in the classroom by role-playing various positions while engaged in a simulated battle. The student population of OBC consists of United States Army and Marine active duty and National Guard Lieutenants as well as various Allied officers. The OBC instructors are a diverse group as well. They are a mix of United States Army and Marine officers and Allied officers with 4-1/2 to 10 years of experience in the military.

OFFICER BASIC COURSE (OBC)

During week 15 of the OBC, students are given an operations order (OPORD) for a battalion-level defensive exercise (see Appendix A). The OPORD details a tactical plan for executing a particular battlefield mission. The students are given approximately 1 week in the classroom to prepare for the battle. During this week, they plan a tactical operation, conduct a terrain walk of Fort Sill to become familiar with the "battleground," and make any necessary modifications before engaging in their battle at the facility. Three weeks after the defensive exercise, they again follow the same procedures for an offensive exercise, only this time, a map study replaces the terrain walk (see Appendix B for offensive OPORD). Little class time is devoted to developing the fire plans. In both battles, students play the roles of company fire support officer (Co FSO), fire support sergeant (FS Sgt), fire support specialist (FS Spec), radio telephone officer (RTO), and possibly a task force (TF) FSO.

OFFICER ADVANCED COURSE (OAC)

Similarly, during the 13th or 14th week of the advanced course, students develop a task force level OPORD for a brigade-level defensive exercise and 7 weeks later develop a battalion- and brigade-level OPORD for a division-level offensive exercise. The instructors often give the students about 1 week of class time to develop a task force OPORD for the defensive battle. In both exercises, the students play the roles of battalion or brigade fire support officer (Bn FSO or

Bde FSO), maneuver company commander (Mvr Co Cdr), TF S2 and S3, TF FSO, and field artillery (FA) battalion S2 and S3.

RESEARCH QUESTION

Many resources are devoted to the Janus Battle Simulation System exercises. Additional Janus exercises have been developed for the OBC and OAC, and the use of Janus or other simulations to train fire supporters is increasing. The instructors and students believe that the cost is well worth the experience, yet to date, no one has systematically determined the success of the Janus Battle Simulation System exercises for students. A research team from Cameron University assumed this task.

STUDY 1: IDENTIFYING OBJECTIVES

Before the extent to which the Janus exercises are successful could be determined, it was necessary to identify the instructors' goals for their students to learn through the Janus exercises. Since the advanced and basic courses are different, we suspected the goals for each course would be different. We interviewed four advanced and several basic course instructors from both the fire support (FS) and combined arms branches. Through interviewing instructors and reviewing documentation concerning Janus, we identified 22 advanced course objectives and 16 basic course objectives.

Instructors were asked to rate, on a Likert-type scale ranging from 1, "very trivial," to 7, "very important," the extent to which they believed each identified objective was important. The means, standard deviations, and minimum and maximum ratings are displayed in Table 1 for the basic course and in Table 2 for the advanced course. The large means and small standard deviations indicate a great consensus among basic and advanced course instructors that most of the objectives are important.

Next, it was necessary to determine specific measures for the objectives. This would allow comparisons to be made between the performance of the groups before the Janus exercise and the performance of the groups after the Janus exercise. We expected that performance would increase between the two experiences. We started with the basic course. Some of the objectives lent themselves quite easily to specific measures, for example, the basic course objective, "Build confidence in students' abilities to plan and execute FS." A questionnaire could be administered before and after the Janus experience to ascertain the extent to which students felt proficient at

various tasks. Other objectives were far more difficult to specifically measure, for example, "Experience students' role as a company FSO or member of the company fire support team (FIST)." If a student participated in the exercise, he or she automatically fulfilled this objective.

Table 1
Identified Objectives for the OBC

Learning objectives	M	SD	Range
Develop and execute a company FS plan	6.81	.54	5-7
Prepare and deliver a company FS briefing	6.81	.40	6-7
Effectively plan and execute trigger points	6.63	.50	6-7
Build confidence in students' abilities to plan and execute FS	6.56	.63	5-7
Experience students' role as a company FSO (or a member of the company fire support team (FIST))	6.50	.73	5-7
Effectively use priority of fires and the clearance of fires	6.37	.62	5-7
Gain "real time" experience in planning, coordinating, and executing FS in conjunction with maneuver forces	6.25	1.00	4-7
Gain experience and appreciation for the command, control, and coordination relationships between the company commander, the company FSO, and the battalion FSO	6.19	.91	5-7
Develop and use the FS execution matrix	6.19	.98	4-7
Participate in a task force FS rehearsal	5.94	.93	4-7
Employ FS assets effectively, to include massing fires and selecting mortars or FA as appropriate	5.88	.81	5-7
Effectively prioritize targets	5.80	1.11	4-7
Employ correct shell/fuze combinations by target type to achieve desired effects; for example, use smoke for obscuration and attack infantry or armor with high explosives (HE) or dual-purpose improved conventional munition (DPICM)	5.22	1.28	2-7
Update target lists, overlays, and available munitions as appropriate	5.06	.77	3-6
Gain exposure to a computer-simulated force-on-force exercise	4.88	1.26	1-6
Employ proper internal and external communication procedures	4.75	1.24	3-7

Specific measures for four of the important and more easily operationalized objectives were developed. Next, we asked all the basic course instructors to rate each measure on a Likert-type scale ranging from 1, "very invalid," to 7, "very valid." See Table 3 for means and standard deviations for the ratings of each measure.

Table 2

Identified Objectives for the OAC

Learning objectives	M	SD	Range
Synchronize maneuver and fires	6.8	.46	6-7
Build confidence in students' abilities to plan and execute FS	6.4	.74	5-7
Develop planned targets, including identifying high payoff targets (HPTs), identifying a task and purpose for each target, and planning for redundancy	6.4	1.10	4-7
Gain appreciation of the cause-and-effect relationship between students' actions during planning and the consequences that result during execution	6.1	.83	5-7
Exercise coordination and teamwork	6.1	.64	5-7
Validate what students have learned through classroom lectures and exercises about fire support planning and execution	6.1	.64	5-7
Understand the military decision making process	6.0	.93	5-7
Gain practical experience in FS execution	6.0	.76	5-7
Appreciate the necessity for conducting rehearsal	6.0	.76	5-7
Understand military aspects of terrain, including land-space management, obstacle placement, FA positioning in order to range targets while not impeding maneuver, and spatial-time relationships	5.0	1.40	3-7
Effectively use FS planning and coordination aids, for example, developing time lines, operations overlays, and target matrices	5.9	1.40	3-7
Conduct fire missions, including employing artillery systems effectively, identifying trigger points, preparing and executing on-order fire missions, and updating target lists, overlays, and available munitions as appropriate	5.8	.71	5-7
Conduct target refinement	5.8	.89	4-7
Identify critical decision points for plan success assessment	5.6	1.20	3-7
Effectively use intelligence information, including prediction of enemy movement and employment of sensors	5.5	1.20	3-7
Employ correct munitions by target type to achieve desired effects, for example, use smoke for obscuration, and attack infantry or armor with HE or DPICM	5.5	.93	4-7
Provide battlefield security	5.5	.76	5-7
Understand all components of combined arms operations	5.4	.74	4-6
Effectively use communication, including proper formats for message traffic, selecting appropriate communication networks, and identifying the need to request information from higher/lower echelons	5.3	1.00	3-6
Perform hasty planning/replanning	5.1	1.90	1-6
Brief instructors playing the role of brigade commander	4.9	.90	3-6
Gain exposure to computer simulation	4.4	.53	4-5

Table 3
Specific Measures of OBC Objectives With Janus

Objective	Measure
No. 1: Develop a company fire support plan	<p>(The number of "YES" answers to the following six questions will be recorded)</p> <p>A. Given the battalion FS execution matrix and the Mvr Co Cdr's guidance, did the FSO develop a company-level FS execution matrix for approval by battalion FSO?</p> <p>B. Were the priority of fires used as directed?</p> <p>C. Were priority targets fired as planned?</p> <p>D. Were planned targets, groups, and/or series fired as planned?</p> <p>E. Were FS coordination measures listed in the FS execution matrix observed?</p> <p>F. Were final protective fires included in the FS execution matrix?</p>
Mean: 5.25	<p>Standard Deviation: 1.86</p> <p>Range: 1-7</p>
No. 2: Prepare and deliver a company FS briefing	<p>No. 1: The number of prompts by instructor during briefing of the five-paragraph field order will be recorded.</p>
Mean: 4.33	<p>Standard Deviation: 1.87</p> <p>Range: 1-7</p> <p>No. 2: The following checklist will be used. The evaluation is based on the sum of the checks.</p> <p>Briefed areas listed from the five paragraph field order format:</p> <ol style="list-style-type: none"> 1. Situation <ol style="list-style-type: none"> a. Enemy forces b. Friendly forces 2. Mission 3. Execution <ol style="list-style-type: none"> a. Concept of operation, including statement of commander's intent b. Organization for combat c. Artillery organization for combat d. Priority of fires e. Other specific tasks f. Coordinating instructions <ol style="list-style-type: none"> 1. HPT list 2. Attack guidance matrix 3. Fire plan 4. FS coordinating measures 5. Ammunition restrictions 4. Service Support 5. Command and signal <ol style="list-style-type: none"> a. Command b. Signal <p>Presence of the three products produced for the measure of company commander:</p> <ol style="list-style-type: none"> 1. FS execution matrix 2. Target Overlay 3. Target List

Table 3 (continued)

Mean: 5.92	Standard Deviation: 2.06	Range: 1-7
No. 3: Plan and execute trigger points	We will ask each instructor to record the number of trigger points and calls for fire that correspond to those trigger points and the number of corresponding calls for fire and create a ratio from the two.	
Mean: 4.15	Standard Deviation: 2.23	Range: 1-7
No. 4: Build confidence in students' abilities to plan and execute FS	Students will complete a paper-and-pencil survey to measure their self-confidence in performing FSO tasks.	
Mean: 4.36	Standard Deviation: 1.69	Range: 1-7

The means, standard deviations, and minimum and maximum ratings indicated that many of the instructors were not satisfied with the specific measures. Comments written on the surveys further confirmed this idea. Several of the instructors wrote many negative comments concerning a particular measure but still gave the measure a rating of 7.

To understand why the instructors overwhelmingly agreed with the objectives and overwhelmingly disagreed with their measures, we conducted extensive interviews with basic and advanced course instructors. The reason was quite clear: the measures failed because the initial objectives were **course** objectives and not objectives specific to the Janus experience. The difficulty in separating the objectives specific to the Janus exercises and the course objectives lies in the fact that the Janus exercises validate what is learned in the course.

Identification of Specific Measures

Interviews with the instructors led to the development of six new objectives and several measures on which both advanced and basic course instructors in the FS and combined arms branches agreed. The six objectives are as follow: (1) increase confidence in students' ability to execute FS, (2) increase students' knowledge of FS techniques, (3) successfully perform battle tracking, (4) successfully establish and use trigger points, (5) successfully engage HPTs, and (6) successfully update information. Measures for each objective were developed with and approved by several instructors.

STUDY 2: MEASURING OBJECTIVES

To understand the facility where the battles are simulated, refer to the diagram of the JBSC (see Appendix C). The physical layout of the Janus facility allowed two separate battles to be run simultaneously, completely independent of one another. The computer monitors display a 60-km x 60-km picture of the terrain, including contour lines, roads, rivers, vegetation, and urban areas.

The battle to be fought is between the Blue Team, directed by a student, and the Red Team, directed by an instructor in the opposing forces (OPFOR) room. The students are assigned to one of two primary positions on the Blue Team, the FSO and the fire support noncommissioned officer (FSNCO) in a "fire support team vehicle" (FISTV). The FSO's job is to coordinate the maneuver commander's FS by planning and controlling fires to ensure they are integrated to support the overall fire mission. The FSO, observing outside the vehicle (actually viewing a Janus monitor arrayed with information that would be available to the FSO on the battlefield) relays his picture of the battlefield to the FSNCO sitting in his FISTV. The FSNCO supports the FSO in the execution of his duties and must know the job well enough to assume control at any time. He is tasked to communicate information given by the FSO over the radio to the fire support element (FSE). The FSE is a collection of personnel and equipment necessary to plan, coordinate, and execute FS at battalion level or higher. In Janus, the FSE is run by an instructor who approves or disapproves the calls for fire made by the FSOs.

There are four FSO positions (Team A, Team B, Team C, and Team D) and four corresponding FIST positions. The Blue Team is distributed among eight separate workstations, each representing an operation or fighting unit that controls a designated portion of the Blue Team. The A and D FSOs and one instructor share a room equipped with five "radios" (telephones) and one computer. The FSOs must portray a picture of the battlefield via radio to their FIST NCOs and the instructor running the FSE. The instructor in the room runs the computer and guides the students when necessary. The same scenario is being run in an adjacent room with the B and C FSOs and another instructor. Each FIST NCO has his own room equipped with one radio with which to communicate with his FSO and a map. The FIST NCO relays information about calls for fire between the FSO and the instructor running the FSE. Once the FSE approves or disapproves the calls for fire, the simulation interactor in the direct support artillery (DS Arty) room actually shoots the approved fires on his computer. All elements of the Blue Team must coordinate their efforts in order to win the battle.

At the conclusion of the battle, the students receive feedback in the form of an after-action review (AAR) facilitated by an instructor. This review is an intensive, step-by-step process that takes place while students watch a computer-generated re-enactment of the battle on a large screen in the AAR room. The AAR highlights the actions that went well, those that did not go well, and ways to improve performance in the future.

Paper-and-pencil tests were administered before the Janus exercise began and after the second AAR. Performance measures were collected for the first and second battles. To gather the necessary data, each telephone conversation that occurred during the battles was recorded and substantive communications were transcribed. From examination of these transcripts, the grid location and the time of identification of each enemy element, the number of fire missions, repeats, adjust fires, “end of mission” reports, “shot” reports, reports of HPTs, and reports of effects were recorded from the battalion FSO’s point of view. In addition, researchers gathered data using the battle replay option with the Janus analyst workstation (JAWS). From the battle replays, the grid location and time of identification of each identified enemy element, the number of rounds fired (i.e., volleys), and the number of times a grid location of an enemy element was within 150 meters of impact were recorded.

Data were collected for 18 OBC defensive and 18 OBC offensive exercises. Because the advanced course exercises are extremely different from the basic course exercises, we did not collect data from OAC exercises. OAC training exercises will be reviewed at a later time.

Table 4 outlines the design of the study. We expected that the first Janus experience would lead to improved performance, greater confidence, and increased knowledge during (and after) the second Janus experience. In addition to the dependent variables, which were developed from the identified objectives, we also recorded performance measures readily available in JAWS (e.g., the force exchange ratio [FER]). This allowed for comparisons between the performance measures obtained from the identified objectives, which are process variables, and the more standard performance measures of JAWS, which are outcome variables.

Thus, in Study 2, three different types of data were collected: (1) objective process measures, (2) subjective process measures, and (3) objective outcome measures. Outcome measures quantify the extent to which the students won the battle. Since many factors other than student competency affect battle outcomes (e.g., luck, opponent’s ability), outcome measures may not adequately measure student competency. Process measures better serve the purpose of measuring student competency. Every objective identified by the instructors was a process

variable. Both objective measures (e.g., number of engaged HPTs) and subjective measures (e.g., student's self-reported proficiency) were used to measure the identified process variables.

Table 4

Experimental Design for Study 2

Before first run	During first run	During second run	After second run
Defensive exercise			
Self-report Proficiency measure	Performance Measures	Performance Measures	Self-report Proficiency measure
Technical knowledge			Technical knowledge
Offensive exercise			
Self-report Proficiency measure	Performance Measures	Performance Measures	Self-report Proficiency measure
Technical knowledge			Technical knowledge

Results

To avoid confusion, analyses and results are presented in terms of the six objectives identified by the instructors.

Objective 1: Increase Confidence in Students' Ability to Execute FS

Students' confidence was measured with a 14-item paper-and-pencil test (see Appendix D). Students were asked to rate their proficiency at performing various tasks, including battle tracking, establishing trigger points, using the HPT list, and updating information. Five point Likert-format scales anchored with "low proficiency" (1) and "high proficiency" (5) were provided. One hundred seven students performing a defensive exercise and 132 students performing an offensive exercise judged their proficiency before the Janus exercise began and after the second AAR. Internal reliability of the scale was high (Cronbach's coefficient $\alpha = .94$). A 2 (battle: before the first battle began versus after the second AAR) by 2 (exercise: defensive versus offensive) repeated measures analysis of variance (ANOVA) indicated main effects for

battle, ($F(1,237) = 89.15, p < .01$), and exercise, ($F(1,237) = 49.03, p < .01$) but no significant interaction. The source table is presented in Table 5.

Table 5
Student Proficiency Source Table

Effect	df	SS	MS	F
Exercise	1	3971.90	3971.90	49.03**
Error	237	19198.57	81.01	
Battle	1	3866.47	3866.47	89.15**
Exercise X battle	1	158.75	158.75	3.66
Error	237	10278.97	43.37	
	* $p < .05$		** $p < .01$	

Students indicated feeling more proficient after the second AAR than before their first battle, M -before = 48.23, M -after = 53.83. This is encouraging, given that increases in confidence were rated as an important objective of the Janus experience ($M = 6.56$ on a 7-point scale). See Table 6 and Figure 1 for means and standard deviations.

Table 6
Means and Standard Deviations for Proficiency Scores

Exercise	Before first battle			After second AAR		Combined	
	n	M	SD	M	SD	M	SD
Defensive	107	44.39	8.68	51.27	7.82	47.83	7.19
Offensive	132	51.35	7.31	55.91	7.82	53.63	5.61
Combined	239	48.23	8.66	53.83	8.14	51.03	6.98

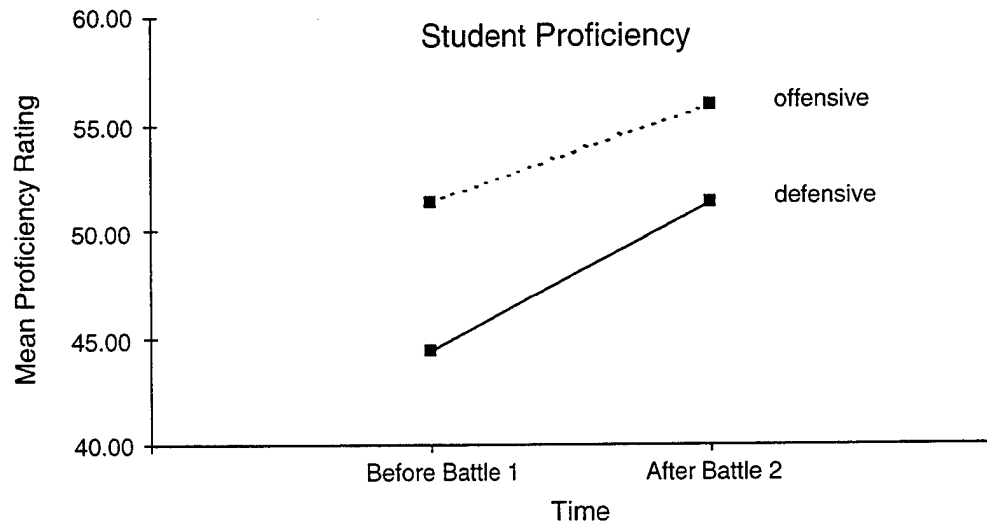


Figure 1. Student proficiency.

Students performing the offensive exercise indicated feeling more proficient than those performing the defensive exercise, $M\text{-offensive} = 53.63$, $M\text{-defensive} = 47.83$. It is important to remember that the offensive exercise occurs later in the course than the defensive exercise. Although one cannot be sure from the design of this study, it is tempting to hypothesize that the officers become more confident as the course progresses and their knowledge level increases.

Objective 2: Increase Students' Knowledge of FS Techniques

Students' knowledge was measured with paper-and-pencil multiple choice tests. The instructors developed a separate test for the defensive (see Appendix E) and offensive exercises (see Appendix F). The tests were developed to contain about three questions to tap students' knowledge of battle tracking, three to measure knowledge of establishing and using trigger points, three to measure knowledge about engaging HPTs, and three concerning knowledge of updating information. Two versions of each test were developed by manipulating the order in which the multiple choice questions were presented. This was necessary to reduce discussion and cheating during the exercises. The number of correct responses was recorded for each student. Since the offensive and defensive tests were different, they were analyzed separately. A 2 (version) by 2 (battle: before the first battle began versus after the second AAR) repeated measures ANOVA was performed separately for defensive and offensive students. Results revealed a significant effect for version for the offensive students, $F(1,131) = 11.06$, $p < .05$, and a significant effect for battle for the defensive students, $F(1,110) = 4.16$, $p < .05$. Defensive

students' performance improved from before the first battle with Janus to after the second AAR. On average, students correctly answered 9.77 of the 12 questions (75%). See Tables 7 and 8 for the source table, means, and standard deviations.

Table 7

Source Tables for Defensive and Offensive Exercise Multiple Choice Tests

Effect	df	SS	MS	F
Defensive exercise				
Version	1	4.07	4.07	1.37
Error	110	326.43	2.97	
Battle	1	6.13	6.13	4.16*
Exercise X battle	1	.19	.19	.13
Error	110	162.24	1.48	
	* p <.05		** p <.01	
Offensive exercise				
Version	1	27.00	27.00	11.06*
Error	131	319.63	2.44	
Battle	1	.03	.03	.02
Exercise X battle	1	4.39	4.39	2.90
Error	131	198.12	1.51	
	* p <.05		** p <.01	

Table 8

Means and Standard Deviations for Multiple Choice Test Scores

Exercise	Before first battle			After second AAR	
	n	M	SD	M	SD
Defensive	112	9.43	1.48	9.76	1.52
Version A-B	47	9.55	1.46	9.95	1.64
Version B-A	65	9.34	1.50	9.62	1.39
Offensive	133	9.98	1.32	9.94	1.46
Version A-B	72	10.39	1.27	10.11	1.50
Version B-A	61	9.49	1.44	9.73	1.40

After collecting these data, five instructors were asked to generate hypotheses as to why the students' performance increased little between the first and second battles. The instructors indicated that several of the questions (e.g., the questions tapping the knowledge of trigger points) were not specifically addressed in the Janus battles. Some indicated that HPTs were not emphasized at all during the students' course work or during the Janus exercises. Thus, it was not a surprise to them that the students' knowledge of HPTs did not improve. In addition, many believed that some of the questions that were developed to measure knowledge of updating information actually measured battle tracking. Thus, the test was skewed to measure knowledge of battle tracking more than other areas.

A correlation between students' proficiency scores and multiple choice test scores revealed a significant but weak relationship, $r(298) = .15, p < .01$. Caution should be used when interpreting the significance of this relationship. With such a large sample size and hence, generous power, it is common to find meaningless significance. Within the social sciences, only correlations greater than .30 are deemed meaningful (Crocker & Algina, 1986).

Thus, students' perceived confidence was only weakly related to students' knowledge as measured by the multiple choice test. In addition, performance in the multiple choice test was not correlated with other group level performance measures. To correlate the individual level variable of exam score with the group-level performance measures, the following procedure was implemented. One student was randomly chosen from each battle and his scores on the multiple choice test were correlated with his group's performance. Next, a different student was randomly chosen from each battle, and his scores were correlated with his group's performance. This was repeated ten times. Examination of the averages of the ten correlations for each measure revealed that performance in the multiple choice test was not related to the group's performance level. However, it is too early to conclude that multiple choice test performance is not related to actual performance. Examining the relationship between an individual-level and group-level variable is problematic. Perhaps the efforts of some of the high-performing individuals were thwarted by low-performing group members in important positions, thereby diminishing the size of the correlation.

Considering how long the instructors needed to generate the multiple choice questions, the difficulties found in generating questions to cover the various content areas and the small correlation between perceived proficiency and performance on the multiple choice test, this measure was not used in the third study.

Objective 3: Successfully Perform Battle Tracking

Through inspection of transcriptions from the recordings of communications on the team intercoms, radio nets, and of the battle replay on the computer, the accuracy, efficiency, and timeliness of spot reporting were determined. Accuracy was determined based on the ratio of the number of accurately reported locations of enemy elements and the total number of reported locations. To determine whether a location was accurately reported, researchers recorded the grid location that was broadcasted on the radio net by the company FSO to the TF FSO (or if that company had priority of fires, to the field artillery fire direction center [FA FDC]). Next, the researcher recorded the actual grid location of the enemy element. The actual grid locations were determined by examining the battle replay. Since it was quickly evident that the groups achieved a high rate of accuracy (e.g., the first six groups analyzed were accurate 86% of the time), we suspected a ceiling effect and this variable was not further analyzed. Because the ceiling effect is partly an artifact of Janus (Janus provides the user with the necessary coordinates), we did not include this measure in the third study.

Efficiency of Spot Reporting

The ratio of the number of grid locations of enemy elements that were reported to the TF FSO by a team or company FSO and the total number of identified enemy elements was the measure of the efficiency of spot reporting used. The higher this ratio, the more efficient the group was at spot reporting. Knowledge of identified enemy elements was obtained through examination of the battle replays. For each identified enemy element, the transcriptions of communications were examined for mention of the enemy element.

A 2 (battle: first battle versus second battle) by 2 (exercise: defensive versus offensive) repeated measures ANOVA revealed a significant interaction, $F(1,16) = 8.95$, $p < .01$. Among the groups performing defensive exercises, improvement was found between the two battles, M -first battle = .56, M -second battle = .67. However, among the groups performing offensive exercises, the students performed better during the first battle than during the second, M -first battle = .75, M -second battle = .61. See Table 9 and Figure 2 for the source table, means, and standard deviations for this measure.

Unfortunately, there are some potential problems with this measure. The battle replays allow for the identification of the enemy element icons that could be examined by the instructor and student FSOs. However, the replays do not provide information concerning which icons were actually seen by the student FSOs. More capable and experienced simulation

interactors are able to make certain enemy element icons more noticeable to student FSOs than can less experienced simulation interactors. In addition, some instructors actually identified some of the enemy elements for their student FSOs; other instructors did not.

Table 9

Source Table and Means and Standard Deviations for Efficiency of Spot Reporting

Effect	df	SS	MS	F
Source table for efficiency of spot reporting				
Exercise	1	.04	.04	.87
Error	16	.72	.05	
Battle	1	.003	.003	.17
Exercise X battle	1	.14	.14	8.95**
Error	16	.25	.02	
	* p < .05		** p < .01	

Means and standard deviations for efficiency of spot reporting

	Battle 1	Battle 2	Combined
Defensive exercise (n = 9)	$\frac{16.22}{30.89} = .56$ (SD = .16)	$\frac{15.11}{23.33} = .67$ (SD = .17)	$\frac{15.67}{27.11} = .61$ (SD = .16)
Offensive exercise (n = 9)	$\frac{13.78}{18.67} = .75$ (SD = .13)	$\frac{13.78}{22.11} = .61$ (SD = .22)	$\frac{13.78}{20.39} = .68$ (SD = .14)
Combined	$\frac{15.00}{24.78} = .65$ (SD = .17)	$\frac{14.44}{22.72} = .64$ (SD = .19)	$\frac{14.72}{23.75} = .65$ (SD = .15)

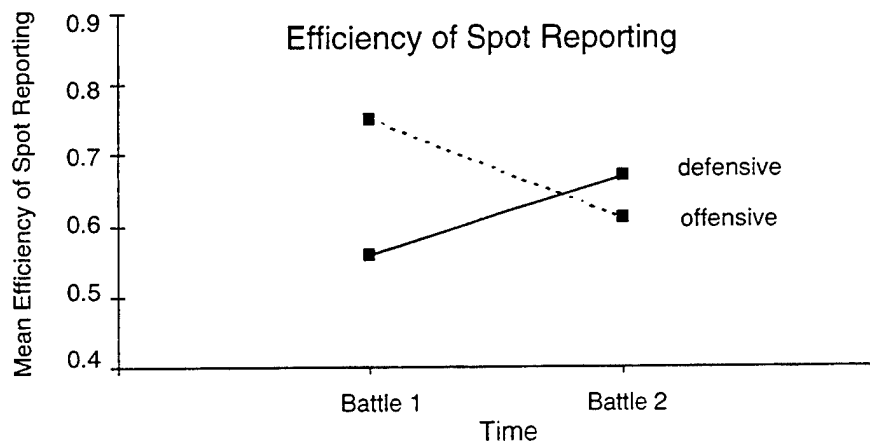


Figure 2. Efficiency of spot reporting.

The officer in charge of the Janus facility identified another problem with the measure. When close air support (CAS) is used by the teams, then the students are unable to see some of the enemy icons, which are readily available on the Janus battle replay. This will artificially deflate the students' performances of the measure of efficiency. This is even more of a problem when one considers that CAS is used much more often during the second battles than during the first battles and more often in offensive battles than in defensive ones. For this reason, this measure was not used during the third study.

Timeliness of Spot Reporting and Calls for Fire

Timeliness was measured with five items. To determine when the students first identified enemy elements, the battle replay was used. The battle replay in JAWS displays the battle time (in seconds). Thus, when enemy elements appeared on the computer screen, the researchers recorded the time the elements appeared. To determine when the students reported the enemy elements to their appropriate group members, the counter on the reel-to-reel tape recorder was used. The recordings began when the battles began and the counter was synchronized to real time. The accuracy of these measures was verified by the following procedure. The researchers identified the times in which major events in the battle replay occurred and then used the counter on the reel-to-reel tape recorders of the major events to estimate the same times. Measures were consistently within one second of one another.

The first measure of timeliness was the average time the company FSO or a team used to report the grid locations of enemy elements to the TF FSO. A 2 (battle: first battle versus second battle) by 2 (exercise: defensive versus offensive) repeated measures

ANOVA revealed an interaction, $F(1,13) = 4.95, p < .05$. The defensive students took longer to communicate to the TF FSO in the second battle than in the first, M-first battle = 51.86 seconds, M-second battle = 84.43 seconds. However, the offensive students did not differ between battles, M-first battle = 53.38 seconds, M-second battle = 52.38 seconds. See Table 10 for source table, means, and standard deviations. See Figure 3 for interaction.

Table 10

Source Table and Means and Standard Deviations for Communication With TF FSO

Effect	df	SS	MS	F
Source table for communication with TF FSO				
Exercise	1	1740.54	1740.54	.92
Error	13	24658.46	1896.80	
Battle	1	1860.61	1860.61	4.37
Exercise X battle	1	2103.81	2103.81	4.95*
Error	13	5529.86	425.37	
	* $p < .05$		** $p < .01$	

Means and standard deviations for communication with TF FSO

Exercise	n	Battle 1		Battle 2		Combined	
		M	SD	M	SD	M	SD
Defensive	7	51.86	29.06	84.43	55.85	68.14	40.75
Offensive	8	53.38	24.59	52.38	17.61	52.88	18.38
Combined	15	52.67	25.78	67.33	42.02	60.00	30.71

It should be noted that students' performance of this measure may be affected by the likelihood of the instructor to prompt the student. Some instructors prompt more than others, and some students are more likely to be prompted by instructors than others. Since this measure varied with respect to instructor, it was not included in the third study.

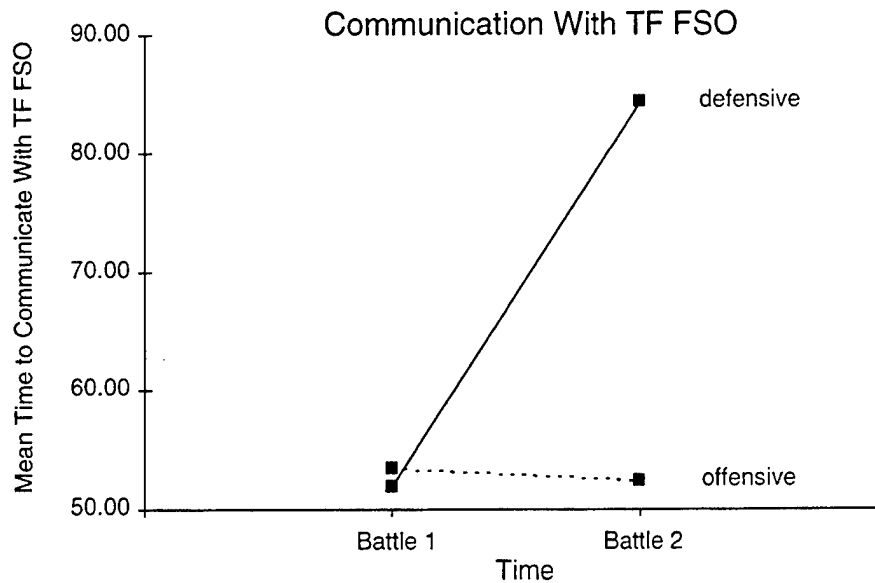


Figure 3. Communication with TF FSO.

Another measure of timeliness was the average time the team or company FSO used to call for fire on an enemy grid location to the DS Arty through the TF FSO. A 2 (battle: first battle versus second battle) by 2 (exercise: defensive versus offensive) repeated measures ANOVA revealed no significant main effects or interactions. Including every possible data point, it took groups an average of about 98.23 seconds to call for fire to the DS Arty by way of the TF FSO. How clear the TF FSO's picture of the battle field is can affect this measure. The company FSO's job is to paint an accurate and timely picture of the battle for the TF FSO who is the primary fire controller. TF FSOs become cautious (and thus take more time) if they are not sure where friendly forces are located in relation to enemy forces or if they are unclear about enemy force composition or friendly force status. The relatively quick mean (i.e., 98.23) indicates that the company FSOs were successful in transmitting pertinent battle information to the TF FSO. See Table 11 for the source table, means, and standard deviations.

However, once again, the students' performance of this measure may be affected by the likelihood of the instructor to prompt the student. Some instructors prompt more than others, and some students are more likely to be prompted by instructors than others. Since this measure varied with respect to instructor, it was not included in the third study.

Table 11

Source Table and Means and Standard Deviations for Communication
to DS Arty Through TF FSO

Effect	df	SS	MS	F			
Source table for communication to DS Arty through TF FSO							
Exercise	1	8833.62	8833.62	2.30			
Error	11	42237.54	3839.78				
Battle	1	3533.55	3533.55	1.79			
Exercise X battle	1	7046.01	7046.01	3.57			
Error	11	21684.84	1971.35				
	* p <.05		** p <.01				
Means and standard deviations for communication to DS Arty through TF FSO							
Exercise	n	Battle 1		Battle 2		Combined	
		M	SD	M	SD	M	SD
Defensive	5	92.80	69.65	150.60	68.11	121.70	56.12
Offensive	8	88.75	53.65	78.88	28.81	83.81	34.89
Combined	13	90.31	57.45	106.46	57.88	98.39	46.13

Timeliness was also measured by the time the team or company FSO used to call for fire on an enemy grid location directly to the DS Arty. A 2 (battle: first battle versus second battle) by 2 (exercise: defensive versus offensive) repeated measures ANOVA revealed no significant main effects or interactions. Including all possible data points, it took groups an average of about 67.70 seconds to communicate directly with the DS Arty. See Table 12 for source table, means, and standard deviations. However, because the students' performance of this measure is affected by the likelihood of the instructor to prompt the student, this measure was not included in the third study.

Among students performing defensive exercises, the average time the team or company FSO used to call for fire on an enemy grid location to mortar platoons via the TF FSO was measured. For the offensive exercise, we did not tape the mortar nets; thus, this variable was not examined for the offensive exercises. In the defensive exercises, measures for both battles were available for only two of the nine groups. Thus, statistical analyses were inappropriate. Among the 10 data points that were available, it took groups an average of about 61.00 seconds to communicate with the mortar platoons through the TF FSO. In addition, we

attempted to measure the time it took teams to communicate with the mortar platoons directly. Not one defensive group communicated during both battles, making statistical analyses impossible. Among the seven data points, the average time it took the team or company FSO to call for fire on an enemy grid location directly to mortar platoons was 147.43 seconds.

Table 12

Source Table and Means and Standard Deviations for Communication With DS Arty

Effect	df	SS	MS	F
Source table for communication with DS Arty				
Exercise	1	238.52	238.52	.11
Error	10	21017.94	2101.79	
Battle	1	5397.52	5397.52	2.02
Exercise X battle	1	1963.52	1963.52	.74
Error	10	26669.94	2666.99	
	* p <.05		** p <.01	

Means and standard deviations for communication with DS Arty

Exercise	n	Battle 1		Battle 2		Combined	
		M	SD	M	SD	M	SD
Defensive	8	69.63	50.00	57.00	23.21	63.31	23.96
Offensive	4	95.50	93.13	44.50	11.47	70.00	46.51
Combined	12	78.25	64.18	52.83	20.41	65.54	31.08

In summary, we did not find evidence that students improved their performance of timeliness of spot reports. This may be attributable to differences in instructor prompting or possibly to a ceiling effect. Instructors who were informed of the data we collected were very impressed with the performance of the students.

End of Mission

The ratio between the number of times “end of mission” was called and the number of fire missions formed the “end of mission” measure. Both measures were determined from examination of the transcriptions of the communications over the telephones. A 2 (battle: first battle versus second battle) by 2 (exercise: defensive versus offensive) repeated measures ANOVA revealed no significant main effects or an interaction. On average, students correctly

called “end of mission” 41% of the time. See Table 13 for the source table, means, and standard deviations.

Table 13

Source Table and Means and Standard Deviations for End of Missions

Effect	df	SS	MS	F
Source table for end of missions				
Exercise	1	.0001	.0001	0.00
Error	16	.97	.06	
Battle	1	.02	.02	.81
Exercise X battle	1	.10	.10	3.94
Error	16	.42	.03	
* p <.05		** p <.01		
Means and standard deviations for end of missions				
		Battle 1	Battle 2	Combined
Defensive exercise		$\frac{9.00}{26.44} = .34$	$\frac{11.78}{23.89} = .49$	$\frac{10.39}{25.17} = .41$
(n = 9)		(SD = .25)	(SD = .18)	(SD = .20)
Offensive exercise		$\frac{7.22}{16.56} = .44$	$\frac{7.56}{20.11} = .38$	$\frac{7.39}{18.33} = .41$
(n = 9)		(SD = .20)	(SD = .19)	(SD = .15)
Combined		$\frac{8.11}{16.56} = .39$	$\frac{9.67}{20.11} = .44$	$\frac{8.89}{18.33} = .41$
		(SD = .23)	(SD = .19)	(SD = .17)

Part of the reason the students appear to perform poorly is attributable to an artifact of the Janus system. In Janus, students cannot fully see the effects of the fire missions, thus increasing the likelihood that the officers will forget to call “end of mission.” In addition, ammunition is not constrained in Janus as it is in the “real” world. Perhaps future versions of Janus will provide smoke rings to the points of impact and constrain ammunition.

Shot

Ratios between the number of times "Shot" was reported from the FDC to the team or company FSO and the number of fire missions, repeats, and adjust fires were formed. Both measures were obtained from examining the transcripts of the communications which took place over the telephones. A 2 (battle: first battle versus second battle) by 2 (exercise: defensive versus offensive) repeated measures ANOVA revealed a significant main effect for exercise, $F(1,16) = 6.32, p < .05$. See Table 14 for source table, means and standard deviations. See Figure 4 for the means.

Table 14

Source Table and Means and Standard Deviations for Shot

Effect	df	SS	MS	F
Source table for shot				
Exercise	1	.66	.66	6.32*
Error	16	1.67	.10	
Battle	1	.00	.00	.00
Exercise X battle	1	.05	.05	1.66
Error	16	.52	.03	
* p <.05		** p <.01		
Means and standard deviations for shot				
	Battle 1	Battle 2	Combined	
Defensive exercise	$\frac{13.89}{37.89} = .43$	$\frac{9.89}{29.78} = .35$	$\frac{11.89}{33.83} = .39$	
(n = 9)	(SD = .26)	(SD = .30)	(SD = .25)	
Offensive exercise	$\frac{14.67}{23.33} = .62$	$\frac{15.78}{23.44} = .70$	$\frac{15.22}{23.39} = .66$	
(n = 9)	(SD = .26)	(SD = .22)	(SD = .21)	
Combined	$\frac{14.28}{30.61} = .53$	$\frac{12.83}{26.61} = .53$	$\frac{13.56}{28.61} = .53$	
	(SD = .26)	(SD = .31)	(SD = .27)	

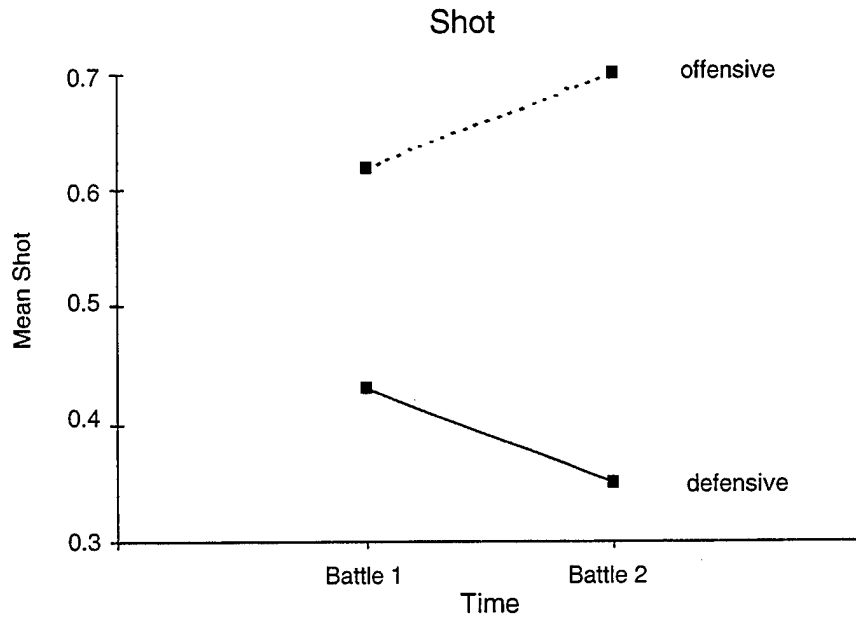


Figure 4. Shot.

Five instructors who were asked to explain the students' performance indicated that this measure is highly dependent on the simulation interactor (or instructor). Janus does not track missions by target numbers. Thus, the simulation interactor must manipulate several screens in a fast manner in order to track missions. A more highly skilled simulation interactor allows for better performance of this measure than does a poorly skilled simulation interactor. Thus, it is not an accurate measure of the students' performance. Perhaps future versions of Janus could include mission numbers in the simulation interactor. Because of these problems, this variable was not measured in the third study.

Summary

In summary, students demonstrated their ability to accurately and effectively perform spot reporting. The results indicate that perhaps the efficiency level of the students increases from the first to the second Janus experience. However, many of the objective measures examined proved to be problematic. Students were found to be less proficient at calling "end of missions" than is desirable, although this may not be as large a problem in a "real" (i.e., not simulated) environment.

Objective 4: Successfully Establish and Use Trigger Points

Although effectively planning and executing trigger points is an important Janus objective ($M = 6.63$ on the 7-point "importance" scale), objective measures of using trigger points proved to be difficult to generate. Instructors indicated that JAWS does not supply users with the

information needed to calculate trigger points (e.g., the timing of impact). In addition, it is not possible to determine the effectiveness of the students' trigger points.

Objective 5: Successfully Engage HPTs

HPT engagement was measured through the ratio of the number of engaged HPTs as identified by the OPORD to the number of reported HPTs identified through examination of the transcriptions of the telephone conversations. Only 1 of the 18 offensive groups and 2 of the 18 defensive groups actually reported an HPT in both the first and second battles and could be included in the analysis. This is to be expected for the offensive exercises because the enemy elements in the offensive exercise are stationary and "dug in" and thus are difficult to see. Although statistical analyses are inappropriate, the groups tended to do better during the second battle than the first (M-first = .48; M-second = .63). See Table 15 for means and standard deviations.

Table 15
Means and Standard Deviations for Engaging HPT

Means and standard deviations for engaging HPT			
	Battle 1	Battle 2	Combined
Combined (n = 3)	$\frac{1.33}{4.67} = .48$	$\frac{1.67}{3.33} = .63$	$\frac{1.50}{4.00} = .56$
	(SD = .45)	(SD = .32)	(SD = .38)

Five instructors, who were asked to generate hypotheses as to why so few groups reported HPTs, indicated that this measure was problematic. The instructors explained that although the students are aware of what an HPT is, they are not taught during the course to fully understand the concepts surrounding engaging HPTs effectively on the battlefield. Thus, in their opinion, this is not an important objective of Janus. In addition, differences between the defensive and offensive exercises cause problems with this measure. During the defensive exercises, the enemy is mobile. Several teams could have spotted the same moving enemy element, yet the element would be engaged only once. This would artificially lower the ratio for the defensive exercises. For these reasons, this measure was not used in the third study.

Objective 6: Successfully Update Information

Ratios between the number of times effects were reported to the team or TF FSO

and the number of fire missions, repeats, and adjust fires formed the update measure. Both measures were determined from examination of the transcriptions of the communications which took place over the telephones. To achieve a perfect score, groups would have to report effects for each fire mission, each repeat, and each call to adjust fires. A (battle: first battle versus second battle) by 2 (exercise: defensive versus offensive) repeated measures ANOVA revealed significant effects for battle, $F(1,16) = 5.88, p < .05$, and exercise, $F(1,16) = 13.56, p < .01$. Table 16 presents the source table, means, and standard deviations; see Figure 5 for the graph. Given that there are differences in mobility between the offensive and defensive enemy elements, thus possibly making the offensive task (in which the enemy are stationary) somewhat easier than the defensive task (in which the enemy are mobile), this measure was not used in the third study.

Table 16
Source Table and Means and Standard Deviations for Updating Information

Effect	df	SS	MS	F
Source table for updating information				
Exercise	1	.38	.38	13.56**
Error	16	.45	.03	
Battle	1	.06	.06	5.88*
Exercise X battle	1	.02	.02	2.04
Error	16	.16	.01	
* p <.05		** p <.01		
Means and standard deviations for updating information				
	Battle 1	Battle 2	Combined	
Defensive exercise	$\frac{4.67}{37.89} = .12$	$\frac{2.56}{29.78} = .08$	$\frac{3.61}{33.83} = .10$	
(n = 9)	(SD = .06)	(SD = .06)	(SD = .04)	
Offensive exercise	$\frac{8.89}{23.33} = .37$	$\frac{5.78}{23.44} = .24$	$\frac{7.33}{23.39} = .31$	
(n = 9)	(SD = .21)	(SD = .15)	(SD = .16)	
Combined	$\frac{14.28}{30.61} = .53$	$\frac{12.83}{26.61} = .53$	$\frac{13.56}{28.61} = .53$	
	(SD = .26)	(SD = .31)	(SD = .27)	

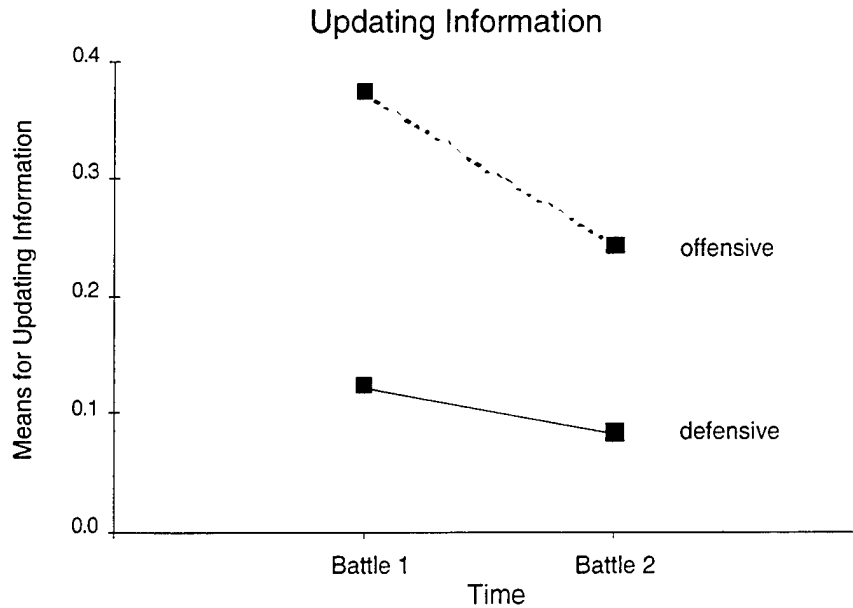


Figure 5. Updating information.

JAWS

In addition to the process measures developed from the identified objectives, outcome variables, which were available from JAWS, were examined. A 2 (battle: first battle versus second battle) by 2 (exercise: defensive versus offensive) repeated measures ANOVA was performed separately for the FER, surviving maneuver force ratio differential (SMFRD), change in combat ratio (ΔCR), and the command and control index of lethality levels (C2ILL). These were chosen for their ease (JAWS calculates these ratios) and because of their use in past studies.

FER

The FER is the ratio of the loss exchange ratio (LER) and the initial force ratio (IFR):

$$LER = \text{Blue Losses} \div \text{Red Losses}$$

$$IFR = \text{Initial Blue Forces} \div \text{Initial Red Forces}$$

$$FER = LER \div IFR$$

Results from the ANOVA revealed that students did not differ between exercises or battles. See Table 17 for source table, means, and standard deviations.

Table 17

Source Table and Means and Standard Deviations for FER

Effect	df	SS	MS	F
Source table for FER				
Exercise	1	.72	.72	1.68
Error	16	6.86	.43	
Battle	1	.14	.14	.45
Exercise X battle	1	.54	.54	1.70
Error	16	5.06	.32	
* p <.05			** p <.01	

Means and standard deviations for FER

Exercise	n	Battle 1		Battle 2		Combined	
		M	SD	M	SD	M	SD
Defensive	9	1.84	.67	1.47	.70	1.66	.50
Offensive	9	1.31	.51	1.43	.53	1.37	.43
Combined	18	1.58	.64	1.45	.61	1.51	.47

SMFRD

The SMFRD is the difference between the percentage of friendly forces that survive and the percentage of OPFOR that survive, with higher SMFRD values being preferable (Lowry, 1995; Thomas, Barber, & Kaplan, 1984):

$$\text{SMFRD} = \text{percent blue survived} - \text{percent red survived}$$

Results from the ANOVA revealed that students did not differ between exercises or battles. See Table 18 for the source table, means, and standard deviations.

Table 18

Source Table and Means and Standard Deviations for SMFRD

Effect	df	SS	MS	F			
Source table for SMFRD							
Exercise	1	.10	.10	1.57			
Error	16	1.05	.07				
Battle	1	.01	.01	.35			
Exercise X battle	1	.10	.10	2.78			
Error	16	.56	.03				
* p <.05		** p <.01					
Means and standard deviations for SMFRD							
		Battle 1		Battle 2		Combined	
Exercise	n	M	SD	M	SD	M	SD
Defensive	9	.31	.22	.17	.22	.24	.15
Offensive	9	.10	.21	.17	.25	.13	.21
Combined	18	.20	.24	.17	.23	.19	.18

 Δ CR

The Δ CR measure is derived from the belief that a higher post-battle than pre-battle combat ratio is desired. The Δ CR is the ratio of the difference between the beginning and end of battle combat ratio and the beginning combat ratio where the combat ratio is the ratio of the total OPFOR and the total friendly forces available for battle (Lowry, 1995; Thomas et al., 1984):

$$\Delta\text{CR} = [\text{IFR} - (\text{blue survived} \div \text{red survived})] \div \text{IFR}$$

Results from the ANOVA revealed that students were more successful during the defensive battles than during offensive battles, $F(1,16) = 44.42, p < .01$. See Table 19 and Figure 6 for source table, means, and standard deviations.

Table 19

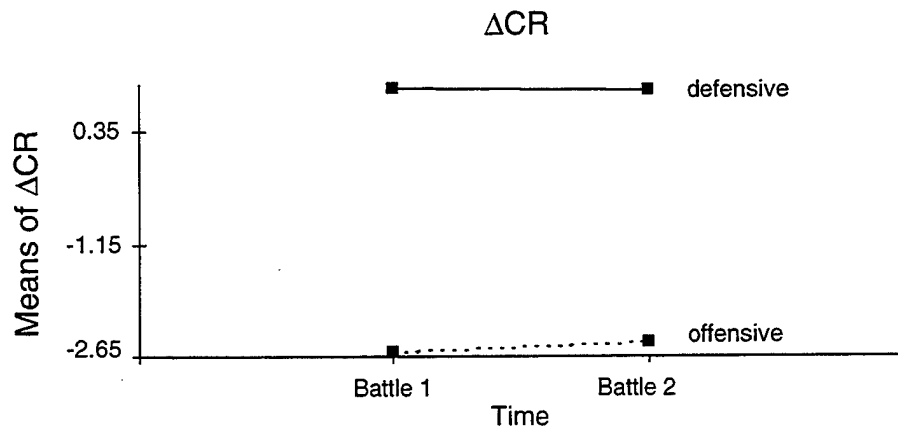
Source Table and Means and Standard Deviations for ΔCR

Effect	df	SS	MS	F
Source table for ΔCR				
Exercise	1	107.83	107.83	44.42**
Error	16	38.84	2.43	
Battle	1	.04	.04	.06
Exercise X battle	1	.06	.06	.10
Error	16	9.93	.62	

* $p < .05$ ** $p < .01$

Means and standard deviations for ΔCR

Exercise	Battle 1			Battle 2		Combined	
	n	M	SD	M	SD	M	SD
Defensive	9	.94	.02	.92	.03	.93	.02
Offensive	9	-2.61	1.53	-2.46	1.94	-2.54	1.56
Combined	18	-.84	2.10	-.77	2.19	-.81	2.08

Figure 6. ΔCR .

C2ILL

Thomas et al. (1984) describe the C2ILL measure as reflecting the importance of retaining a large percentage of friendly forces while destroying a large percentage of

enemy forces. C2ILL is the sum of the percentage of OPFOR eliminated and half of the percentage of the friendly forces that survive (Lowry, 1995; Thomas et al., 1984).

$$C2ILL = [\text{percent blue survived} \div 2] + [\text{percent red losses}]$$

The ANOVA revealed no significant main effects or interactions. See Table 20 for the source table, means, and standard deviations.

Table 20
Source Table and Means and Standard Deviations for C2ILL

Effect	df	SS	MS	F			
Source table for C2ILL							
Exercise	1	.04	.04	.99			
Error	16	.66	.04				
Battle	1	.001	.001	.07			
Exercise X battle	1	.08	.08	3.03			
Error	16	.41	.03				
* p <.05			** p <.01				
Means and standard deviations for C2ILL							
		Battle 1		Battle 2		Combined	
Exercise	n	M	SD	M	SD	M	SD
Defensive	9	1.01	.20	.91	.18	.96	.13
Offensive	9	.85	.16	.93	.18	.89	.16
Combined	18	.93	.19	.92	.18	.93	.14

Correlational Analyses

Correlations between each of the variables were determined for the group-level performance measures (see Table 21). This provides added insight into the relationship among the process and outcome variables. It may also have served as a guide for future research, especially if, for example, some of the more time-intensive measures are highly correlated to some of the less time-intensive measures. Inspection of the correlations between the process and outcome variables did not reveal any significant relationships.

The lack of a relationship between the outcome and process variables is not surprising, given the number of instructors who told us during interviews that it was not important whether their students won the battle. They continually stressed to us the importance of the process and diminished the importance of the outcome measures. Thus, the outcome measures were not included in the third study.

Table 21
Correlations Between Performance Variables

Process variables	FER	Outcome variables		
		SMFRD	C2ILL	ΔCR
Efficiency of spot reporting	-.09	.00	-.05	-.01
Time Co FSO used to communicate with TF FSO	-.15	-.09	-.10	-.26
Time Co FSO used to communicate with DS Arty via TF FSO	-.02	.04	-.02	.44
Time Co FSO used to communicate directly with DS Arty	.28	.31	.32	.01
"End of mission" calls	.06	-.05	-.08	-.03
"Shot" calls	.47	.44	.33	.21
Engagement of HPTs	.14	.31	.37	-.65
Updating information	-.47	-.42	-.32	-.71
	* p <.05	** p <.01		

Conclusions

Responses to surveys and interviews with the instructors of the OBC and OAC led to the identification of six objectives the students were to master through experiences with the Janus simulated battle system: (1) increase confidence in students' ability to execute FS, (2) increase students' knowledge of FS techniques, (3) successfully perform battle tracking, (4) successfully establish and use trigger points, (5) successfully engage HPTs, and (6) successfully update information.

Measures of the objectives taken before or during the students' first battle with Janus were compared to measures taken after or during the students' second battle with Janus. In addition, comparisons were made between the defensive and offensive exercises. Survey results indicated that students' confidence significantly increased from before the Janus exercise began to after the second AAR and from the defensive to the offensive exercise.

Performance measures indicated that the officers were successful at battle tracking, improved their efficiency of spot reporting from their first to second Janus experience, demonstrated a high degree of proficiency at accurately reporting the grid locations of enemy elements and reporting the locations in a timely manner but a rather low degree of proficiency at calling “end of missions” and updating information. Many of the objective measures proved to be problematic because of variations in instructor input and the way in which Janus operates. Table 22 provides a review of the problems with each of the measures.

Consistent with instructors’ hypotheses, correlational analyses revealed weak relationships between process and outcome variables (see Table 21).

Table 22
Objective Measures and Their Problems

1. Accuracy of battle tracking	No. accurately reported locations ÷ total No. reported locations	Janus provides the coordinates of elements
2. Efficiency of spot reporting	No. enemy elements reported ÷ total No. identified enemy elements	<ul style="list-style-type: none"> - Computer ability of instructor affects performance - CAS can’t be seen on battle replay - Some instructors prompt more than others
3. Timeliness of spot	a) CoFSO→TF FSO b) CoFSO→TF FSO→DS Arty c) CoFSO→DS ARTY d) CoFSO→TF FSO→Mortars e) CoFSO→Mortars	Some instructors prompt more than others
4. End of missions	No. times “end of missions” called ÷ No. fire missions+No. repeats+ No. adjust fires	<ul style="list-style-type: none"> - Cannot see effects in Janus - Ammunition not constrained in Janus
5. Shot	No. times “shot” called ÷ No. fire missions+No. repeats+ No. adjust fires	- Computer ability of instructor affects performance
6. HPT	No. engaged HPT	<ul style="list-style-type: none"> - Instructors indicate not an important objective of Janus - Differences between offensive and defensive exercises will affect performance
7. Update information	No. reported effects ÷ No. fire missions+No. repeats+ No. adjust fires	- Differences between offensive and defensive exercises will affect performance

STUDY 3: MEASURING OBJECTIVES WITH INSTRUCTOR AND STUDENT RATINGS

In addition to increasing our knowledge of how the Janus experience affects students' confidence and proficiency, the results of Study 2 illuminated the difficulty in measuring the objectives that instructors have for their students. Although the instructors are most knowledgeable about what they wish the officers to learn, they are not well informed about how the Janus system operates. Thus, many of the measures that were generated and used were flawed because of Janus artifacts. Also, many of the people who are experts on the Janus system are not well informed about what the instructors want the officers to learn and do not strive to minimize confounds such as instructor or even interactor coaching. A mastery of both areas is needed in order to generate valid measures of the training objectives. In addition, the variation introduced by differences in ability and style of the instructors proved to create problems in measuring some of the objectives. Thus, in the next study, we relied primarily on subjective measures to assess the objectives.

We decided to focus on the training objectives that earned a rating of 6.00 or higher in importance. Thus, the following nine objectives were selected: (1) develop and execute a company FS plan; (2) prepare and deliver a company FS briefing; (3) effectively plan and execute trigger points; (4) build confidence in students' abilities to plan and execute FS; (5) experience students' role as a company FSO (or a member of the company FIST); (6) effectively use priority of fires and the clearance of fires; (7) gain "real time" experience in planning, coordinating, and executing FS in conjunction with maneuver forces; (8) gain experience and appreciation for the command, control, and coordination relationships between the company commander, the company FSO, and the battalion FSO; and (9) develop and use the FS execution matrix.

Similar to Study 2, students were asked to rate their proficiency using 7-point Likert scales before the first battle and after the second AAR. The design was similar to that of Study 2 (see Table 23).

Results

For most of the instructor ratings, a 2 (battle: first battle versus second battle) by 2 (exercise: defensive versus offensive) repeated measures ANOVA was performed. For most of the student ratings, a 2 (battle: before the first battle versus after the second AAR) by 2 (exercise: defensive versus offensive) repeated measures ANOVA was performed. We expected each Janus

experience to improve officer confidence and performance as measured by instructor ratings and self-reported assessments.

Table 23

Experimental Design for Study 3

Before first run	During first run	After first run	During second run	After AAR	After second run
Defensive exercise					
Self-reported proficiency measure	Performance measures	Instructor ratings	Performance measures	Self-reported proficiency measure	Instructor ratings
Offensive exercise					
Self-reported proficiency measure	Performance measures	Instructor ratings	Performance measures	Self-reported proficiency measure	Instructor ratings

Objective 1: Develop and Execute an FS Plan

The only experience students are given in executing an FS plan, which they developed, is through Janus. Thus, this is one of the primary objectives of the Janus experience. This objective was rated as the most important objective ($M = 6.81$ on a 7-point importance scale). Many instructors emphasized the importance of students watching their plan unfold and using alternate plans throughout a battle. Designing objective methods to measure this learning objective proved to be an insurmountable task. The more common objective measures (e.g., number of red losses or the FER) proved to be useless. Instructors continually informed us that groups with superior plans who executed the plans well often lost many “men” through no fault of their own. Similarly, groups with less-than-perfect plans who were less coordinated and less proficient in their execution of the plan often lost few “men” purely because of luck. In lieu of objective measures, subjective measures were used. Instructors and students were asked to rate the officers’ performance and ability to develop and execute an FS plan.

Instructors’ Rating of the FS plan

A 2 (battle: first battle versus second battle) by 2 (exercise: defensive versus offensive) repeated measures ANOVA performed with the average of the two company

FSO instructors' responses to "Rate the effectiveness of the FSO/team's FS plan" revealed a significant effect of battle, $F(1,22) = 5.33, p < .04$. Instructors indicated that the FS plan for the afternoon exercises was better than that for the morning exercises, M -morning = 2.26; M -afternoon = 3.61. See Table 24 and Figure 7 for source table, means, and standard deviations.

Table 24

Source Table and Means and Standard Deviations for Instructors' Rating of the FS Plan

Effect	df	SS	MS	F
Source table for instructors' rating of the FS plan				
Exercise	1	.05	.05	.19
Error	22	5.45	.25	
Battle	1	1.40	1.40	5.33*
Exercise X battle	1	.03	.03	.10
Error	22	5.78	.26	
* $p < .05$			** $p < .01$	

Means and standard deviations for instructors' rating of the FS plan

	n	Battle 1		Battle 2		Combined	
		M	SD	M	SD	M	SD
Exercise							
Defensive	10	3.25	.49	3.55	.33	3.40	.26
Offensive	14	3.27	.65	3.66	.45	3.46	.41
Combined	24	3.26	.58	3.61	.40	3.44	.35

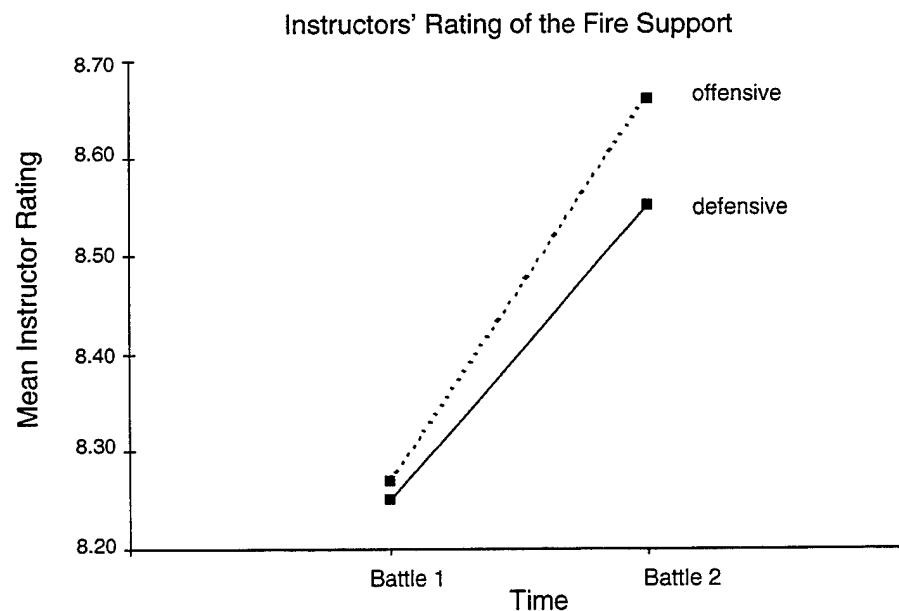


Figure 7. Instructors' rating of the FS plan.

Instructors' Rating of the Execution of the FS plan

Although the afternoon plans were better than the morning plans, the execution of the plan did not differ. A 2 (battle: first battle versus second battle) by 2 (exercise: defensive versus offensive) repeated measures ANOVA performed with the average of the two company FSO instructors' responses to "Rate the FSO/team's execution of the FS plan" revealed no significant differences. See Table 25 for source table, means, and standard deviations. This is not surprising, given the large role the FSOs play and the changing of the FSO officers. The execution of the plan is highly determined by the activities and performances of the four FSOs. If the officers playing the FSO roles in the morning were to also play the FSO roles in the second battle, one would expect an increase in the performance of the execution of the FS plan. However, the officers who play the FSO roles in the morning did **not** play the FSO role in the afternoon exercise. For this reason, we would not necessarily expect an improvement in the execution of the plan.

Table 25

Source Table and Means and Standard Deviations for Instructors' Rating of the Execution of the FS Plan

Effect	df	SS	MS	F
Source table for instructors' rating of the execution of the FS plan				
Exercise	1	.00	.00	.03
Error	22	3.84	.17	
Battle	1	1.06	1.06	3.34
Exercise X battle	1	.00	.00	.00
Error	22	7.00	.32	

* p < .05

** p < .01

Means and standard deviations for instructors' rating of the execution of the FS plan

Exercise	n	Battle 1		Battle 2		Combined	
		M	SD	M	SD	M	SD
Defensive	10	3.25	.46	3.55	.54	3.40	.26
Offensive	14	3.27	.33	3.57	.62	3.42	.32
Combined	24	3.26	.38	3.56	.57	3.41	

Students' Rating of Their Ability to Prepare an FS Plan

A 2 (battle: before the first battle began versus after the second AAR) by 2 (exercise: defensive versus offensive) repeated measures ANOVA performed with the students' responses on a 5-point Likert scale anchored with "low" (1), "average" (3), and "high" (5) to the item, "My proficiency in using information I have learned in the classroom to prepare a FS plan is _____" revealed significant effects for battle, $F(1,405) = 159.58, p < .01$, and exercise, $F(1,405) = 17.96, p < .01$. Students indicated more proficiency after the second AAR of the day than before performing any battles that day, and officers performing the second exercise (i.e., the offensive exercise) felt more proficient than those performing the first exercise. In addition, there was an interaction between the two variables, $F(1,405) = 5.45, p < .02$. Before their experiences with the Janus battle simulation system (i.e., before the first defensive battle), the officers did not indicate they felt as proficient in their ability to use the information they had learned in the classroom to prepare a FS plan as after performing at least two battles (i.e., after the second AAR for the defensive exercise or before and after the offensive exercises). See Table 26 and Figure 8 for source table, means, and standard deviations.

Table 26

Source Table and Means and Standard Deviations for Students' Rating of Their Ability to Prepare an FS Plan

Effect	df	SS	MS	F
Source table for students' rating of their ability to prepare an FS plan				
Exercise	1	12.82	12.82	17.96**
Error	405	289.09	.71	
Battle	1	53.52	53.52	159.58**
Exercise X battle	1	1.83	1.83	5.45*
Error	405	135.84	.34	
* $p < .05$			** $p < .01$	

Means and standard deviations for students' rating of their ability to prepare an FS plan

	n	Battle 1		Battle 2		Combined	
		M	SD	M	SD	M	SD
Exercise							
Defensive	216	3.29	.76	3.90	.68	3.59	.58
Offensive	191	3.63	.73	4.05	.72	3.84	.62
Combined	407	3.45	.77	3.97	.70	3.71	.61

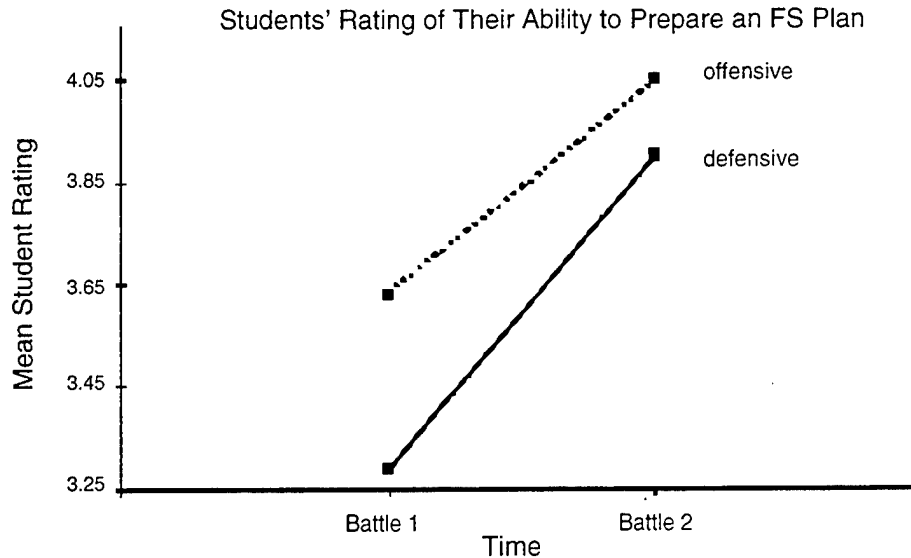


Figure 8. Students' rating of their ability to prepare an FS plan.

Students' Rating of Their Ability to Use the Company Commander's Guidance in Preparing the FS Plan

The pattern of results is consistent with the hypothesis that each experience with Janus increases student confidence. The 2 (battle: before the first battle began versus after the second AAR) by 2 (exercise: defensive versus offensive) repeated measures ANOVA for students' rating of their proficiency at incorporating their company commander's guidance into their FS plan revealed significant effects for battle, $F(1,406) = 113.65, p < .01$, and exercise, $F(1,406) = 30.44, p < .01$. Before the first experience with Janus, the confidence level is its lowest ($M = 3.45$). After participating in two battles and two defensive AARs, the confidence rating increases to a moderate level ($M = 3.87$). About 3 weeks later, when the officers were brought back into the Janus facility, the confidence level had not changed from the moderate level ($M = 3.80$). After the two additional battles and two offensive AARs, the confidence level reached its highest level ($M = 4.22$ on a 5-point scale). See Table 27 and Figure 9 for the source table, means, and standard deviations.

Summary: Develop and Execute an FS Plan

Instructors indicated that the afternoon performance of the teams was superior to that of the morning exercises in overall performance and in the effectiveness of the FS plan. They did not rate the execution of the FS plans differently in the afternoon than in the morning, but this is not surprising because the execution of the plan relies heavily on the performance of the FSOs, and the FSOs in the morning are different from the FSOs in the afternoon. Instructors did not differentially rate the offensive and defensive FS plans or their execution.

Table 27

Source Table and Means and Standard Deviations for Students' Rating of the Use of Company Commander's Guidance in Preparing the FS Plan

Effect	df	SS	MS	F
Source table for students' rating of the use of company commander's guidance in preparing the FS plan				
Exercise	1	24.31	24.31	30.44**
Error	406	324.13	.80	
Battle	1	35.74	35.74	113.65**
Exercise X battle	1	.00	.00	.00
Error	406	127.66	.31	
* p < .05			** p < .01	

Means and standard deviations for students' rating of the use of company commander's guidance in preparing the FS plan

	n	Battle 1		Battle 2		Combined	
		M	SD	M	SD	M	SD
Exercise							
Defensive	216	3.45	.76	3.87	.77	3.66	.66
Offensive	192	3.80	.73	4.22	.71	4.01	.60
Combined	408	3.62	.77	4.03	.76	3.82	.65

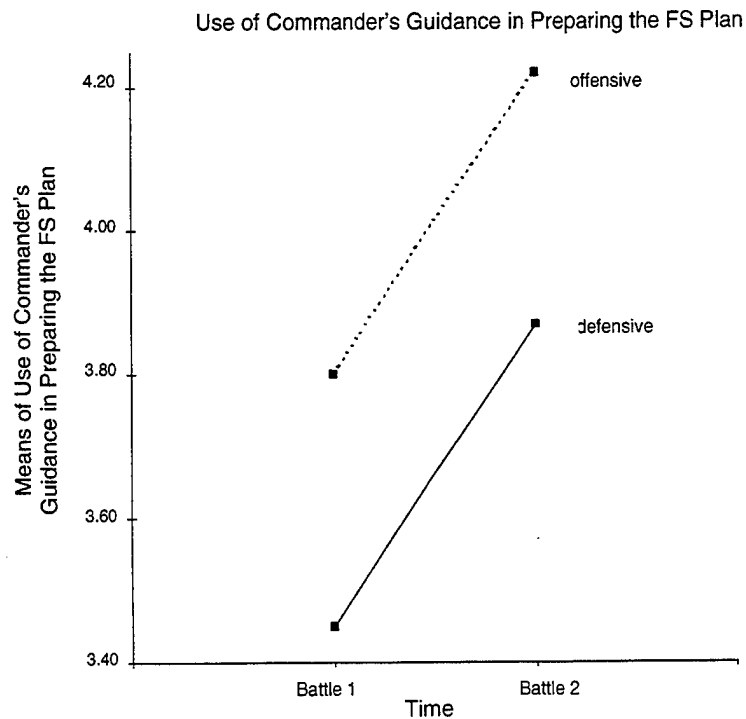


Figure 9. Use of company commander's guidance in preparing the FS plan.

For most measures, students felt more proficient with each Janus experience. They reported feeling less confident in preparing a FS plan and coordinating FS in synchronization with maneuver before their first Janus experience than after having some experience with Janus.

In reporting their confidence in using the FS execution matrix, incorporating their company commander's guidance into their FS plan, and efficiently shifting fires, students indicated feeling more confident with each Janus experiences. The lowest ratings of proficiency levels were reported before any Janus battles were performed; moderate proficiency levels were reported after two Janus battles and two AARs were completed; high proficiency levels were reported after four Janus battles and four AARs were completed.

Objective 2: Prepare and Deliver a Company FS Briefing

Students prepare and deliver FS briefings throughout the OBC. This is not unique to the Janus experience. However, instructors indicated that they felt one of the benefits of performing the Janus exercises is the additional practice at delivering briefs. Only the four FSOs actually deliver a briefing. However, all the officers listen to the briefing; some take notes.

Instructors' Rating of the FSO's briefing

Instructors were asked to rate the FSOs' provision of each of the 13 elements, which should be included in company FS briefing (according to FM 6-71) on a 3-point scale as follows. If the element was not included, the FSO was given one point; if the element was included only after prompting from the instructor, the FSO was given two points; if the element was included without prompting, the FSO was given three points. The total number of points earned was then divided by the number of the 13 elements for which the instructor rated the FSO. For most FSOs, this was 13. However, some instructors did not feel that some of the elements were necessary, and thus, a number less than 13 was used. Thus, the briefing ratio ranged from 1 to 3, with 1 indicating a briefing that included none of the important elements and 3 indicating a briefing including all the important elements.

A 2 (battle: first battle versus second battle) by 2 (exercise: defensive versus offensive) repeated measures ANOVA performed with the average of the four FSOs' briefing ratio indicated that the afternoon briefings were superior to the morning briefings, $F(1,21) = 7.49, p < .02$, $M\text{-morning} = 2.81$; $M\text{-afternoon} = 2.92$. The afternoon FSOs seemed to learn to include these elements from watching the morning FSOs perform their briefings. Note the high level of performance of the briefings, 2.87 on a 3-point scale. See Table 28 and Figure 10 for the source table, means, and standard deviations.

Table 28

Source Table and Means and Standard Deviations for Instructors' Rating of the FSOs' Briefing

Effect	df	SS	MS	F
Source table for instructors' rating of the FSOs' briefing				
Exercise	1	.00	.00	.00
Error	21	.33	.02	
Battle	1	.11	.11	7.49*
Exercise X battle	1	.01	.01	.33
Error	21	.32	.02	
* p < .05		** p < .01		

Means and standard deviations for instructors' rating of the FSOs' briefing

Exercise	n	Battle 1		Battle 2		Combined	
		M	SD	M	SD	M	SD
Defensive	7	2.80	.18	2.93	.05	2.86	.10
Offensive	16	2.82	.15	2.91	.08	2.87	.09
Combined	23	2.81	.16	2.91	.07	2.86	.09

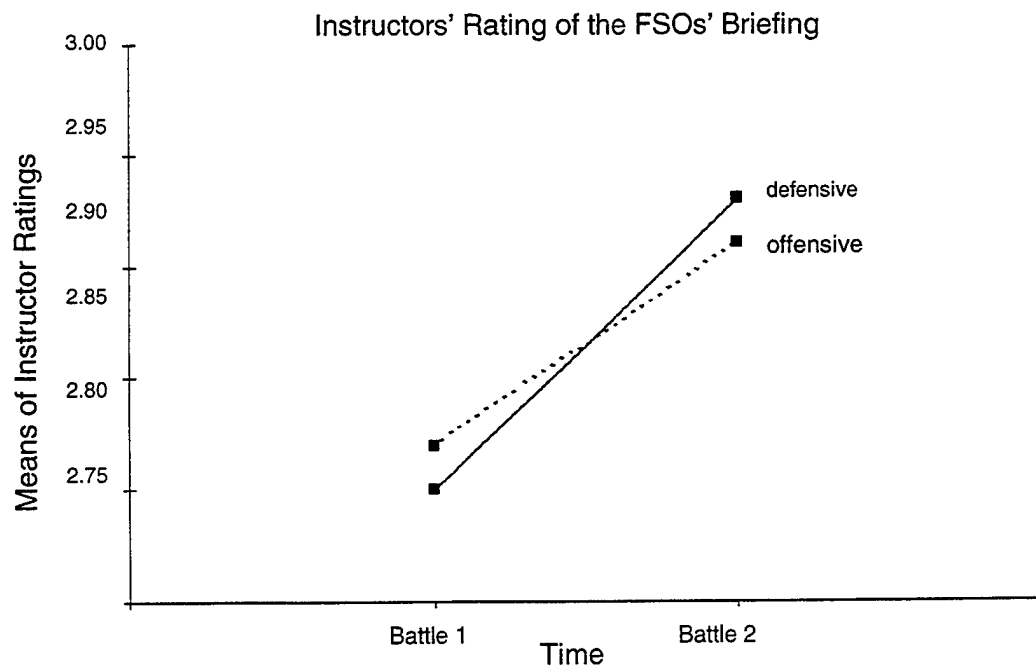


Figure 10. Instructors' rating of the FSOs' briefing.

Instructors' Rating of the Quality of the FSOs' Briefing

The instructors were asked to rate the quality of the FSOs' briefing. Instructors were asked to "Please indicate the percentage of other briefs you heard that were WORSE than this one. Thus, LOW percentages indicate poor performance and HIGH percentages indicate excellent performances." A 0 to 100 scale in multiples of 10 was provided. A 2 (battle: first battle versus second battle) by 2 (exercise: defensive versus offensive) repeated measures ANOVA did not indicate any significant differences between the morning and afternoon briefings or between the briefs for offensive exercises and those for defensive exercises. See Table 29 for the source table, means and standard deviations. We suspect a ceiling effect may have occurred. Even for the first briefing, the average rating for the FSOs was 70.45%. Thus, instructors believed that less than 30% of all the briefings they had heard were better than these officers' briefings. When performance is this high, it is difficult to improve.

Table 29

Source Table and Means and Standard Deviations for Instructors' Rating
of the Quality of the FSOs' Briefing

Effect	df	SS	MS	F
Source table for instructors' rating of the quality of the FSOs' briefing				
Exercise	1	.42	.42	.00
Error	24	3057.27	127.39	
Battle	1	245.05	245.05	3.67
Exercise X battle	1	.46	.46	.01
Error	24	103.03	66.79	
* p <.05			** p <.01	

Means and standard deviations for instructors' rating of the quality of the FSOs' briefing

Exercise	n	Battle 1			Battle 2		Combined	
		M	SD		M	SD	M	SD
Defensive	11	70.45	9.41		74.66	7.75	72.56	.50
Offensive	15	70.08	9.92		74.67	11.33	72.38	8.54
Combined	26	70.24	9.51		74.66	9.80	72.45	7.82

In addition, this measure may not have been as sensitive as needed in another way. The low standard deviations, $SD = 7.82$, indicate that the instructors rated the FSOs' briefings similarly. Perhaps the responses would have been more informative if we had asked the instructors to compare the FSOs' briefing to other briefings they had heard before a defensive or offensive Janus exercise, rather than to compare the briefing to all other briefings the instructor had heard.

Students' Rating of Their Ability to Deliver a Briefing

A 2 (battle: before the first battle began versus after the second AAR) by 2 (exercise: defensive versus offensive) repeated measures ANOVA performed on the students' response to "My proficiency at delivering a briefing is ____" revealed significant effects for battle, $F(1,405) = 159.40, p < .01$, and exercise, $F(1,405) = 16.05, p < .01$. See Table 30 and Figure 11 for the source table, means, and standard deviations. Inspection of the means reveal a pattern consistent with the hypothesis that each experience with Janus increased the students' confidence level. Before the first experience with Janus, the confidence level is its lowest ($M = 3.17$). After observing or participating in two briefings at the Janus facility, the confidence rating increases to a moderate level ($M = 3.63$). It is surprising that during the next 3 weeks during which students had opportunities to participate in and/or observe other briefings, their confidence did not increase. When the officers returned to the Janus facility, their confidence level in delivering a brief had not changed from the moderate level ($M = 3.40$). After the two additional briefings, the confidence level reached its highest level ($M = 3.94$ on a 5-point scale).

Summary: Prepare and Deliver a Company FS Briefing

Overall, both students and instructors indicated the officers' ability to prepare and deliver briefings was at a very high level. Students indicated feeling more confident in their ability to prepare and deliver a company FS briefing with each Janus experience; instructors indicated that the students were more proficient at including all the necessary elements of a FS briefing during the second exercise of the day than during the first exercise of the day.

Table 30

Source Table and Means and Standard Deviations for Students' Rating of Their Ability to Deliver a Briefing

Effect	df	SS	MS	F
Source table for students' rating of their ability to deliver a briefing				
Exercise	1	14.75	14.75	16.05**
Error	405	372.23	.92	
Battle	1	50.90	50.90	159.40**
Exercise X battle	1	.30	.30	.92
Error	405	129.33	.32	
* p < .05				** p < .01

Means and standard deviations for students' rating of their ability to deliver a briefing

Exercise	n	Battle 1		Battle 2		Combined	
		M	SD	M	SD	M	SD
Defensive	215	3.17	.82	3.63	.80	3.40	.70
Offensive	192	3.40	.75	3.94	.77	3.67	.65
Combined	407	3.28	.80	3.78	.80	3.53	.69

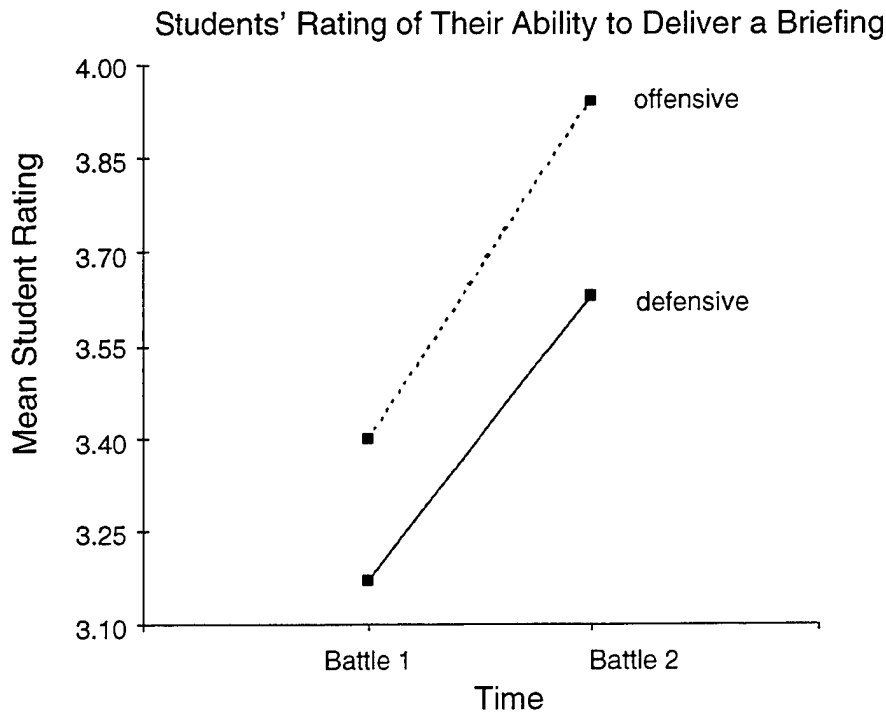


Figure 11. Students' rating of their ability to deliver a briefing.

Objective 3: Effectively Plan and Execute Trigger Points

Although students learn how to plan trigger points before entering the Janus facility, one of the objectives of the Janus experience is to effectively plan and execute the trigger points. Several subjective measures were used to rate the students' competency.

Instructors' Rating of Students' Ability to Establish Trigger Points

A 2 (battle: first battle versus second battle) by 2 (exercise: defensive versus offensive) repeated measures ANOVA performed with the average of the two company FSO instructors' responses to "Rate the FSO/team's performance in accurately establishing trigger points" revealed a significant effect of battle, $F(1,22) = 11.06, p < .01$. See Table 31 and Figure 12 for the source table, means, and standard deviations. Instructors indicated that the officers were better at establishing trigger points during the afternoon exercises than during the morning exercises, $M\text{-morning} = 3.10$; $M\text{-afternoon} = 3.60$. Differences between the offensive and defensive exercises were not found.

Table 31

Source Table and Means and Standard Deviations for Instructors' Rating of Students' Ability to Establish Trigger Points

Effect	df	SS	MS	F			
Source table for instructors' rating of students' ability to establish trigger points							
Exercise	1	.54	.54	2.44			
Error	22	4.84	.22				
Battle	1	2.59	2.59	11.06**			
Exercise X battle	1	.07	.07	.31			
Error	22	5.16	.23				
* p <.05			** p <.01				
Means and standard deviations for instructors' rating of students' ability to establish trigger points							
		Battle 1		Battle 2		Combined	
Exercise	n	M	SD	M	SD	M	SD
Defensive	10	2.98	.45	3.53	.40	3.25	.24
Offensive	14	3.27	.52	3.66	.50	3.46	.38
Combined	24	3.15	.50	3.60	.45	3.38	.34

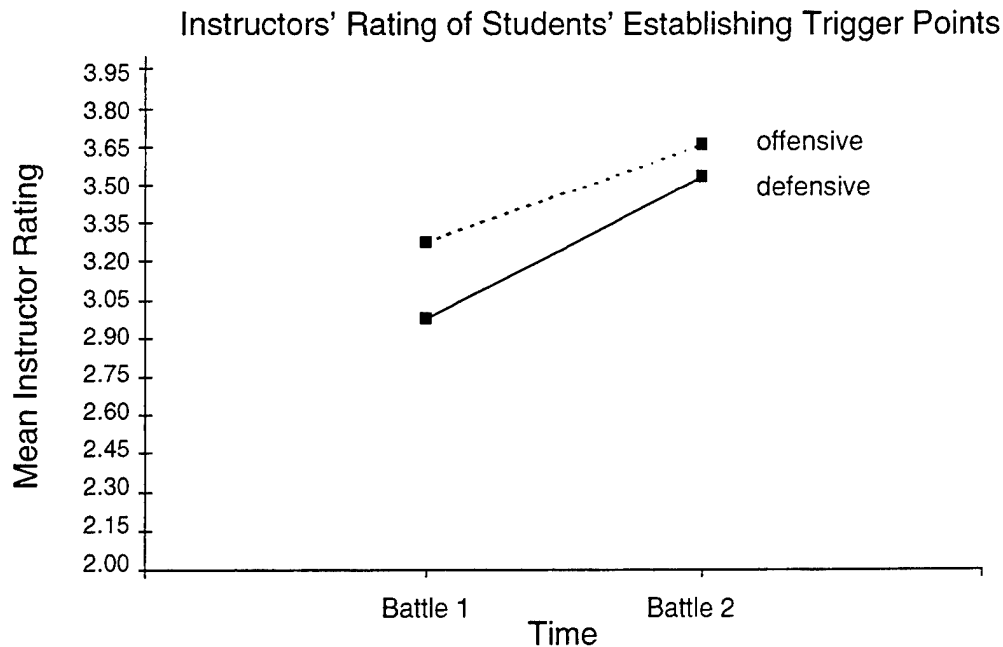


Figure 12. Instructors' rating of students' ability to establish trigger points.

Students' Rating of Their Ability to Establish Trigger Points

A 2 (battle: before the first battle began versus after the second AAR) by 2 (exercise: defensive versus offensive) repeated measures ANOVA performed to the students' response to "My proficiency at establishing trigger points is ____" revealed significant effects for battle, $F(1,406) = 253.05, p < .01$, and exercise, $F(1,406) = 32.69, p < .01$. See Table 32 and Figure 13 for the source table, means, and standard deviations. Inspection of the means reveals a pattern consistent with the hypothesis that each experience with Janus increases student confidence. Before the first experience with Janus, the confidence level was its lowest ($M = 2.90$). After two battles and two defensive AARs were completed, the confidence rating increased to a moderate level ($M = 3.51$). About 3 weeks later, when the officers were brought back into the facility, the confidence level had not changed from the moderate level ($M = 3.29$). After the two additional battles and two offensive AARs, the confidence level reached its highest level ($M = 3.80$ on a 5-point scale).

Thus, both the students and the instructors believed that the students gained proficiency in establishing trigger points from the morning to the afternoon exercise. In addition, students rated their ability higher during the offensive battle than during the defensive battle.

Table 32

Source Table and Means and Standard Deviations for Students' Rating of
Their Ability to Establish Trigger Points

Effect	df	SS	MS	F
Source table for students' rating of their ability to establish trigger points				
Exercise	1	23.26	23.26	32.69**
Error	406	288.91	.71	
Battle	1	62.81	62.81	253.05**
Exercise X battle	1	.52	.52	2.10
Error	406	100.77	.25	
		* p < .05		
		** p < .01		

Means and standard deviations for students' rating of their ability to establish trigger points

Exercise	n	Battle 1		Battle 2		Combined	
		M	SD	M	SD	M	SD
Defensive	216	2.90	.71	3.51	.73	3.21	.62
Offensive	192	3.29	.65	3.80	.66	3.54	.57
Combined	408	3.09	.71	3.64	.71	3.37	.62

Students' Rating of Their Ability to Establish Trigger Points

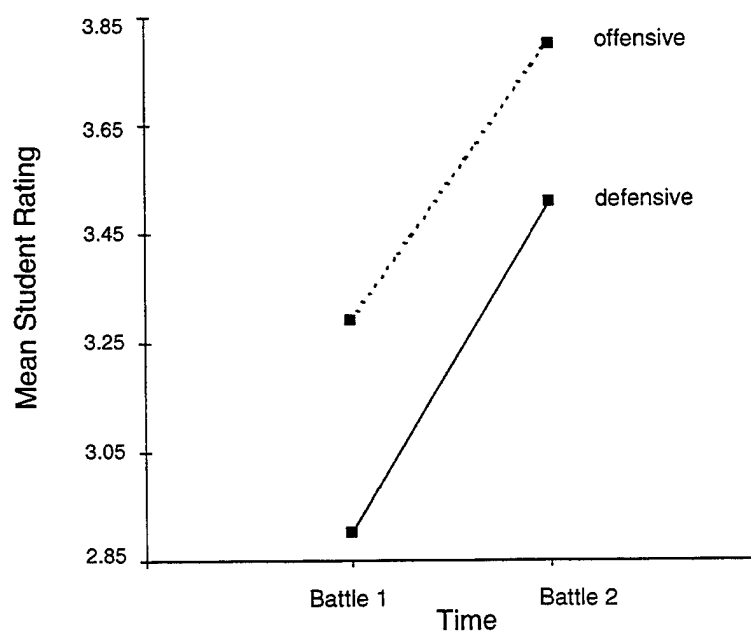


Figure 13. Students' rating of their ability to establish trigger points.

Instructors' Rating of Students' Ability to Use Trigger Points During Calls for Fire

A 2 (battle: first battle versus second battle) by 2 (exercise: defensive versus offensive) repeated measures ANOVA performed to the average of the two company FSO instructors' responses to "Rate the FSO/team's use of trigger points when calling for fire" revealed significant effects for battle, $F(1,22) = 8.32, p < .01$, and exercise, $F(1,22) = 6.76, p < .02$.

Inspection of the means reveals a pattern consistent with the hypothesis that each experience with Janus increases students' ability to use the trigger points during calls for fire. During the first experience with Janus, the instructors' rating of performance was its lowest ($M = 2.88$). During the second battle, the students' rating by the instructors increased to a moderate level ($M = 3.48$). About 3 weeks later, when the officers were brought back into the facility, their ability level had not changed from the moderate level ($M = 3.41$ for the third battle, i.e., the first offensive battle). Performance reached its highest level on the last battle ($M = 3.75$ on a 5-point scale). See Table 33 and Figure 14 for the source table, means, and standard deviations.

Table 33

Source Table and Means and Standard Deviations for Instructors' Rating of the Use of Trigger Points During Calls for Fire

Effect	df	SS	MS	F
Source table for instructors' rating of use of trigger points during calls for fire				
Exercise	1	1.92	1.92	6.76*
Error	22	6.24	.28	
Battle	1	2.57	2.57	8.32**
Exercise X battle	1	.20	.20	.64
Error	22	6.80	.31	

* $p < .05$

** $p < .01$

Means and standard deviations for instructors' rating of use of trigger points during calls for fire

	n	Battle 1		Battle 2		Combined	
		M	SD	M	SD	M	SD
Exercise							
Defensive	10	2.88	.60	3.48	.57	3.18	.40
Offensive	14	3.41	.52	3.75	.51	3.58	.36
Combined	24	3.19	.60	3.64	.54	3.41	.42

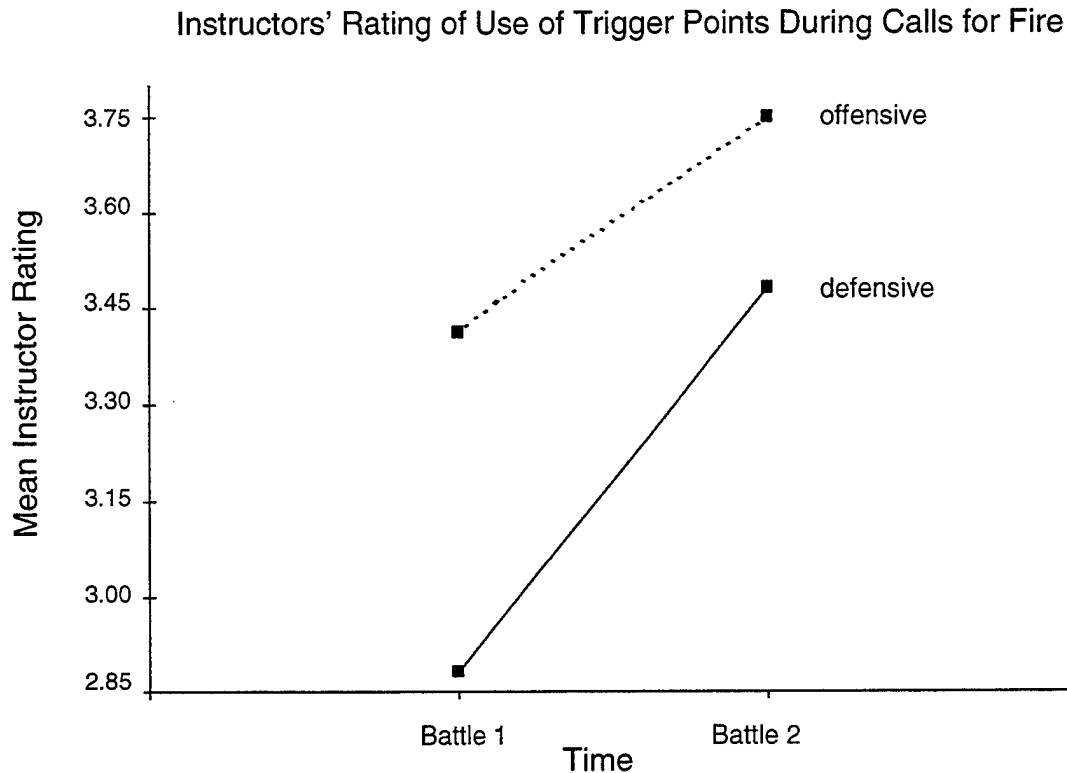


Figure 14. Instructors' rating of the use of trigger points during calls for fire.

Students' Rating of Their Ability to Use Trigger Points When Calling for Fire

A similar pattern of results was found when students were asked to respond to "My proficiency at using trigger points when calling for fire is ____." The 2 (battle: before the first battle began versus after the second AAR) by 2 (exercise: defensive versus offensive) repeated measures ANOVA revealed significant effects for battle, $F(1,405) = 262.01$, $p < .01$, and exercise, $F(1,405) = 64.81$, $p < .01$. See Table 34 and Figure 15 for the source table, means, and standard deviations. Once again, before the first experience with Janus, the confidence level was its lowest ($M = 2.87$). After two battles and two defensive AARs were completed, the confidence rating increased to a moderate level ($M = 3.51$). About 3 weeks later, when the officers were brought back into the facility, the confidence level had not changed from the moderate level ($M = 3.35$). After the two additional battles and two offensive AARs, the confidence level reached its highest level ($M = 4.02$ on a 5-point scale). Thus, both the students and instructors believed that the officers became more proficient at using trigger points when calling for fire with each Janus experience.

Table 34

Source Table and Means and Standard Deviations for Students' Rating of Their Ability to Use Trigger Points When Calling for Fire

Effect	df	SS	MS	F
Source table for students' rating of their ability to use trigger points when calling for fire				
Exercise	1	50.07	50.07	64.81**
Error	405	312.86	.77	
Battle	1	85.60	85.60	262.01**
Exercise X battle	1	.06	.06	.18
Error	405	132.32	.33	
		* p < .05		
		** p < .01		

Means and standard deviations for students' rating of their ability to use trigger points when calling for fire

Exercise	n	Battle 1		Battle 2		Combined	
		M	SD	M	SD	M	SD
Defensive	215	2.87	.77	3.51	.80	3.19	.67
Offensive	192	3.35	.71	4.02	.67	3.69	.57
Combined	407	3.10	.78	3.75	.78	3.43	.67

Students' Rating of Use of Trigger Points During Calls for Fire

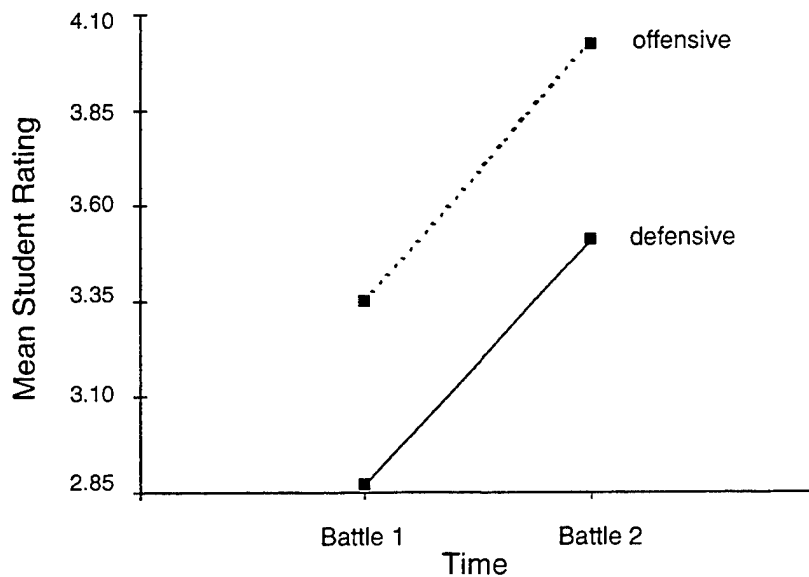


Figure 15. Students' rating of the use of trigger points during calls for fire.

Students' Success Ratio in Executing Trigger Points

The survey provided to the officers after the second AAR included two questions that were not included on the morning survey. Students were asked to indicate the number of trigger points they had successfully executed and the number of trigger points they had attempted. A ratio was formed from these two numbers. An ANOVA performed to compare the ratio obtained with the offensive and defensive exercises revealed that officers were more successful at executing trigger points when performing the second exercises (i.e., the offensive exercises) than when performing the first battles (i.e., the defensive exercises), $F(1,328) = 18.15$, $p < .01$, $M_{\text{defensive}} = .83$; $M_{\text{offensive}} = .96$. See Table 35 for the source table, means, and standard deviations.

Table 35

Source Table and Means and Standard Deviations for Students' Success Ratio in Executing Trigger Points

Effect	df	SS	MS	F
Source table for students' success ratio in executing trigger points				
Exercise	1	1.50	1.50	18.15**
Error	328	27.09	.08	
	* $p < .05$		** $p < .01$	
Means and standard deviations for students' success ratio in executing trigger points				
Battles 1 and 2				
Exercise	n	M	SD	
Defensive	164	.83	.34	
Offensive	166	.96	.22	

Interpreting this result is somewhat problematic. Is the improved performance attributable to an actual increase in performance or to difficulty differences in the defensive and offensive exercises? In addition, there is a question about whether the officers have enough information to ascertain the level of success of the trigger points they executed.

Instructors' Rating of the Timeliness of the Call for Fire for Trigger Points

After the briefing, the instructors listed the trigger points the team had identified and indicated whether the trigger point was called for in a timely manner. Of course, during the course of the battle, some of the trigger points were not used; thus, no rating was indicated. A ratio was formed between the number of calls for fire in which trigger points were used in a timely manner and the number of calls for fire involving trigger points. The greater the ratio, the better the group was at using trigger points.

A 2 (battle: first versus second) by 2 (exercise: defensive versus offensive) repeated measures ANOVA did not reveal differences between the morning and afternoon exercises or between the offensive and defensive exercises. This may be attributable to a ceiling effect. Even during the first battle, students sent 80% of the calls for fire, which were indicated by trigger points, in a timely manner.

Table 36

Source Table and Means and Standard Deviations for Instructors' Rating of the Timeliness of the Call for Fire for Trigger Points

Effect	df	SS	MS	F			
Source table for instructors' rating of the timeliness of the call for fire for trigger points							
Exercise	1	.05	.05	1.52			
Error	19	.65	.03				
Battle	1	.00	.00	.04			
Exercise X battle	1	.01	.01	.27			
Error	19	.38	.02				
* p <.05		** p <.01					
Means and standard deviations for instructors' rating of the timeliness of the call for fire for trigger points							
	Battle 1			Battle 2		Combined	
Exercise	n	M	SD	M	SD	M	SD
Defensive	6	.80	.18	.78	.21	.79	.18
Offensive	15	.85	.18	.89	.12	.86	.11
Combined	21	.84	.17	.86	.15	.85	.13

Summary: Successfully Plan and Execute Trigger Points

Students and instructors agree that the officers become more proficient at successfully planning and executing trigger points with each Janus experience. For the most part, the instructors and students rate the officers' ability to establish trigger points and to use the trigger points when calling for fire at a higher level for the afternoon exercise than for the morning exercise and at a higher level for the offensive exercise than the defensive exercise. Although the timeliness of calling for fires using the trigger points did not increase with each Janus experience, it was considered to be at a high level by the instructors.

Objective 4: Build Confidence in Students' Abilities to Prepare and Execute an FS Plan

This objective was identified as one of the most important objectives that the instructors hoped their officers would meet during their experiences at the simulation center. Students were asked to rate their proficiency at completing essential tasks. Similar to the previously discussed students' ratings of their abilities, the 2 (battle: before the first battle began versus after the second AAR) by 2 (exercise: defensive versus offensive) repeated measures ANOVA revealed significant effects for battle, $F(1,405) = 106.80, p < .01$, and exercise, $F(1,405) = 20.51, p < .01$. See Table 37 and Figure 16 for source table, means, and standard deviations. Before the first experience with Janus, students' confidence level was at its lowest ($M = 3.32$). After two battles and two defensive AARs were completed, their confidence ratings increased to a moderate level ($M = 3.73$). About 3 weeks later, when the officers were brought back into the Janus facility, the confidence level had not changed from its moderate level ($M = 3.65$). After the two additional battles and two offensive AARs, the confidence level reached its highest level ($M = 3.96$ on a 5-point scale). Thus, the experience with Janus led to an increase in the students' confidence in their ability to prepare and execute an FS plan.

Objective 5: Experience Students' Role as a Company FSO (or a member of the company FIST)

Each officer is given the opportunity to play the role of an FSO at least once during the four battle experiences with Janus; thus, this objective is met.

Table 37

Source Table and Means and Standard Deviations for Students' Rating of
Their Ability to Complete Essential Tasks

Effect	df	SS	MS	F
Source table for students' rating of their ability to complete essential tasks				
Exercise	1	16.10	16.10	20.51**
Error	405	317.96	.79	
Battle	1	27.11	27.11	106.80**
Exercise X battle	1	.57	.57	2.25
Error	405	102.79	.25	
* p <.05		** p <.01		

Means and standard deviations for students' rating of their ability to complete essential tasks

	n	Battle 1		Battle 2		Combined	
		M	SD	M	SD	M	SD
Exercise							
Defensive	215	3.32	.77	3.73	.72	3.53	.64
Offensive	192	3.65	.69	3.96	.70	3.81	.61
Combined	407	3.47	.75	3.84	.72	3.60	.64

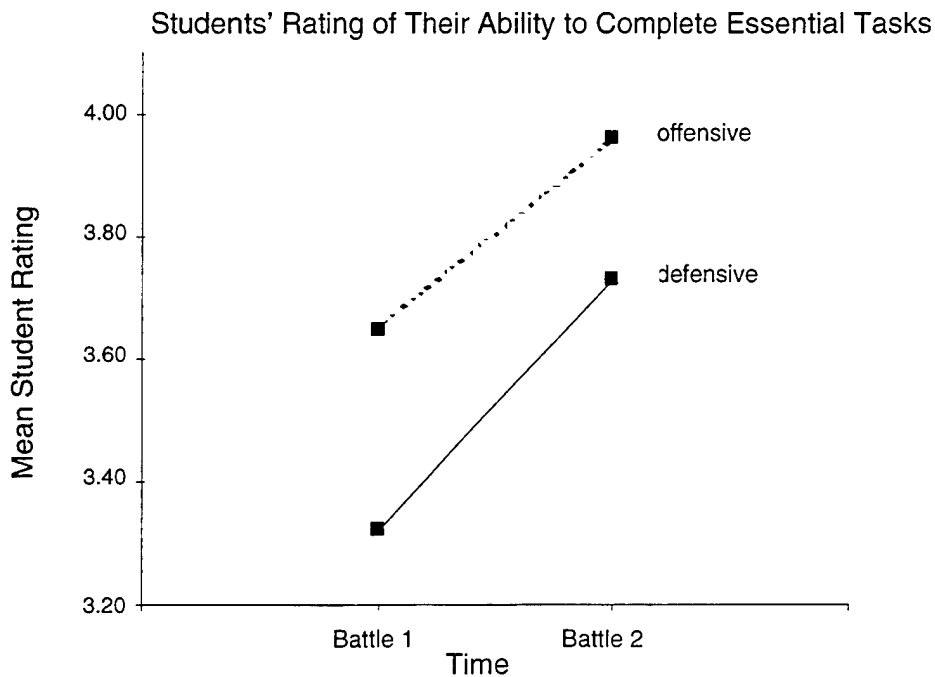


Figure 16. Students' rating of their ability to complete essential tasks.

Objective 6: Effectively Use Priority of Fires and the Clearance of Fires

Students and instructors were asked to indicate how well the officers were able to designate priority fires, request changes in priority of fires, and execute spot reports.

Students' Rating of Their Ability to Designate Priority Targets

A 2 (battle: before the first battle began versus after the second AAR) by 2 (exercise: defensive versus offensive) repeated measures ANOVA performed to the students' responses to "My proficiency at understanding the purpose of designating priority targets is ____" revealed a significant effect for battle, $F(1,406) = 44.88, p < .01$. See Table 38 and Figure 17 for the source table, means, and standard deviations. Officers rated their proficiency at understanding the purpose of designating priority targets higher after the second AAR than before the two battles of the day (M-morning = 3.75; M-afternoon = 4.0).

Table 38

Source Table and Means and Standard Deviations for Students' Rating of Their Ability to Designate Priority Targets

Effect	df	SS	MS	F
Source table for students' rating of their ability to designate priority targets				
Exercise	1	1.81	1.81	1.98
Error	406	371.48	.91	
Battle	1	15.69	15.69	44.88**
Exercise X battle	1	.16	.16	.45
Error	406	141.92	.35	
* $p < .05$			** $p < .01$	

Means and standard deviations for students' rating of their ability to designate priority targets

	n	Battle 1		Battle 2		Combined	
		M	SD	M	SD	M	SD
Exercise							
Defensive	216	3.73	.85	4.03	.81	3.88	.71
Offensive	192	3.85	.77	4.10	.73	3.97	.63
Combined	408	3.78	.82	4.06	.77	3.92	.68

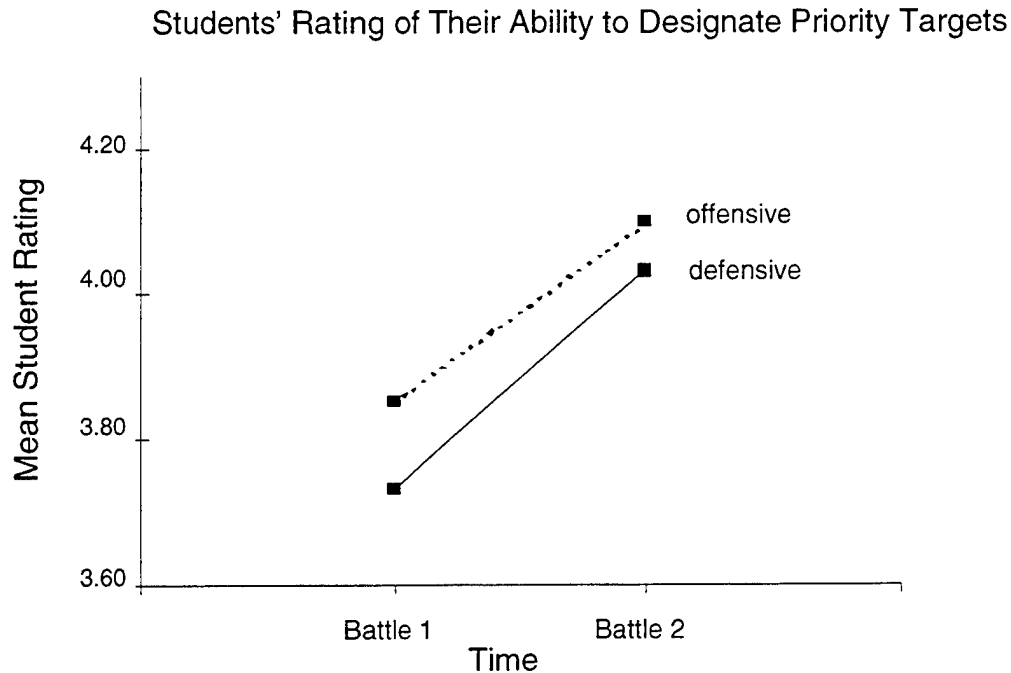


Figure 17. Students' rating of their ability to designate priority targets.

Students' Rating of Their Ability to Request a Change in Priority of Fires

A similar pattern of results was found when students were asked to rate their proficiency at requesting a change in priority of fires. The 2 (battle: before the first battle began versus after the second AAR) by 2 (exercise: defensive versus offensive) repeated measures ANOVA revealed significant effects for battle, $F(1,405) = 199.85, p < .01$, and exercise, $F(1,405) = 35.92, p < .01$. See Table 39 and Figure 18 for the source table, means, and standard deviations. Once again, before the first experience with Janus, students' confidence level for relaying information was at its lowest ($M = 2.71$). After two battles and two defensive AARs were completed, the confidence rating increased to a moderate level ($M = 3.53$). About 3 weeks later, when the officers were brought back into the simulation center, the confidence level had not changed from the moderate level ($M = 3.30$). After the two additional battles and two offensive AARs, the confidence level reached its highest level ($M = 3.77$ on a 5-point scale). In addition, an interaction was found, $F(1,405) = 15.05, p < .01$. The improvement from the morning to the afternoon battle in the students' perceived ability to request a change in priority of fires for the defensive exercise was more dramatic than the improvement from the morning to the afternoon battle for the offensive exercise, D -defensive = .82; D -offensive = .47.

Table 39

Source Table and Means and Standard Deviations for Students' Rating of Their Ability to Request a Change in Priority of Fires

Effect	df	SS	MS	F
Source table for students' rating of their ability to request a change in priority of fires				
Exercise	1	34.63	34.63	35.92**
Error	405	390.46	.96	
Battle	1	84.65	84.65	199.85**
Exercise by battle	1	6.37	6.37	15.05**
Error	405	171.55	.42	
* p < .05			** p < .01	

Means and standard deviations for students' rating of their ability to request a change in priority of fires

	n	Battle 1		Battle 2		Combined	
		M	SD	M	SD	M	SD
Exercise							
Defensive	215	2.71	.85	3.53	.85	3.12	.68
Offensive	192	3.30	.88	3.77	.74	3.54	.71
Combined	407	2.99	.91	3.65	.81	3.32	.72

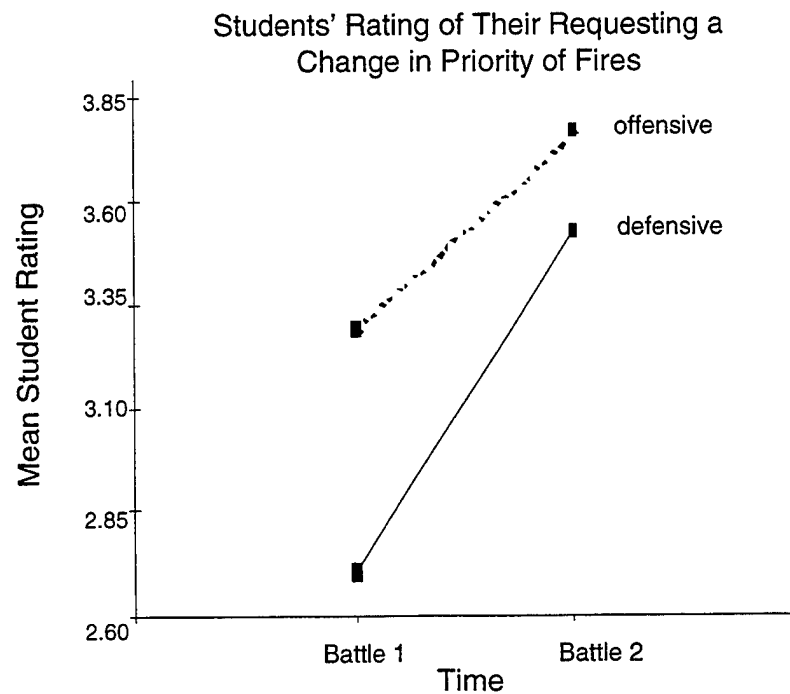


Figure 18. Students' rating of their ability to request a change in priority of fires.

Completeness of Spot Reports

This objective was examined, in part, with a measure of the quality of the spot reports. Using a transcript of all substantive comments spoken over the battalion FS net, researchers assigned a team one point for every time the TM/FSO included information concerning the size, activity, location, and equipment in an individual spot report. The total number of points was divided by four times the number of spot reports. Thus, if the team/FSO included all four pieces of information for every spot report, the team would earn a perfect score, 1.00. If the team/FSO included an average of only half of the information, the team would earn a .50.

A 2 (battle: first battle versus second battle) by 2 (exercise: defensive versus offensive) repeated measures ANOVA performed to the average of the four teams' scores did not reveal any significant main effects or a significant interaction. See Table 40 for the source table, means, and standard deviations. We believe this is because of a ceiling effect. Even during the first battle, FSO/TMs included an average of 72% of the necessary pieces of information. With performance at this high a level, it is difficult to improve.

Table 40

Source Table and Means and Standard Deviations for Completeness of Spot Reports

Effect	df	SS	MS	F
Source table for completeness of spot reports				
Exercise	1	.00	.00	.10
Error	20	.26	.01	
Battle	1	.00	.00	.04
Exercise X battle	1	.00	.00	.15
Error	20	.16	.008	
	* p <.05		** p <.01	
Means and standard deviations for completeness of spot reports				
	Battle 1	Battle 2	Combined	
Defensive exercise	$\frac{60.90}{84.40} = .72$	$\frac{70.60}{102.30} = .71$	$\frac{65.75}{93.35} = .71$	
(n = 10)	(SD = .07)	(SD = .12)	(SD = .08)	
Offensive exercise	$\frac{33.17}{47.33} = .70$	$\frac{45.08}{62.33} = .71$	$\frac{39.13}{54.83} = .71$	
(n = 12)	(SD = .08)	(SD = .12)	(SD = .08)	
Combined	$\frac{45.77}{64.18} = .71$	$\frac{56.68}{80.50} = .71$	$\frac{51.23}{72.34} = .71$	
	(SD = .08)	(SD = .12)	(SD = .08)	

Completeness of Spot Reports

This objective was examined, in part, with a measure of the quality of the spot reports. Using a transcript of all substantive comments spoken over the battalion FS net, researchers assigned a team one point for every time the TM/FSO included information concerning the size, activity, location, and equipment in an individual spot report. The total number of points was divided by four times the number of spot reports. Thus, if the team/FSO included all four pieces of information for every spot report, the team would earn a perfect score, 1.00. If the team/FSO included an average of only half of the information, the team would earn a .50.

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Table 40

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Effect	df	SS	MS	F
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Exercise	1	.00	.00	.10
Error	20	.26	.01	
Battle	1	.00	.00	.04
Exercise X battle	1	.00	.00	.15
Error	20	.16	.008	
	* p <.05		** p <.01	
Means and standard deviations for completeness of spot reports				
	Battle 1	Battle 2	Combined	
Defensive exercise	<u>60.90</u> = .72	<u>70.60</u> = .71	<u>65.75</u> = .71	
(n = 10)	84.40	102.30	93.35	
	(SD = .07)	(SD = .12)	(SD = .08)	
Offensive exercise	<u>33.17</u> = .70	<u>45.08</u> = .71	<u>39.13</u> = .71	
(n = 12)	47.33	62.33	54.83	
	(SD = .08)	(SD = .12)	(SD = .08)	
Combined	<u>45.77</u> = .71	<u>56.68</u> = .71	<u>51.23</u> = .71	
	64.18	80.50	72.34	
	(SD = .08)	(SD = .12)	(SD = .08)	

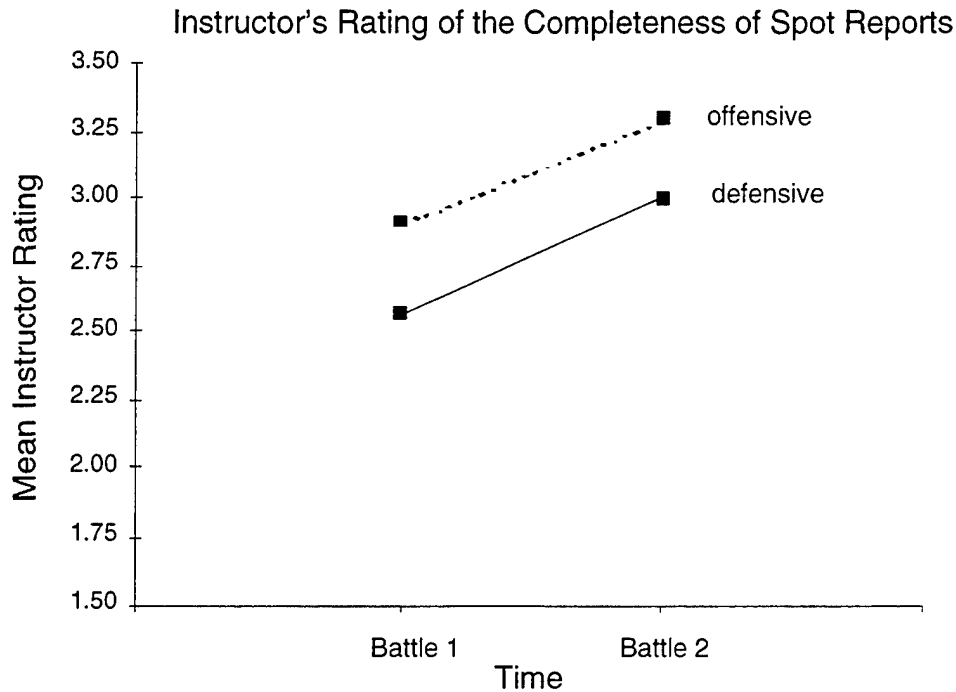


Figure 19. Instructors' rating of the completeness of spot reports.

Instructors' Rating of Students' Proficiency in Sending Spot Reports

A 2 (battle: first battle versus second battle) by 2 (exercise: defensive versus offensive) repeated measures ANOVA performed to the instructors' responses to "Rate the Team's performance at sending spot reports" revealed a significant effect for battle, $F(1,23) = 5.16$, $p < .04$. See Table 42 and Figure 20 for the source table, means, and standard deviations. The instructors believed that the officers were more proficient in sending spot reports during the second battle of the day than during the first battle of the day, M-morning = 2.99; M-afternoon = 3.34. Instructors did not differentially rate the performance in sending spot reports of the officers performing defensive exercises from those performing offensive exercises.

Table 42

Source Table and Means and Standard Deviations for Instructors' Rating of the Students' Proficiency in Sending Spot Reports

Effect	df	SS	MS	F			
Source table for instructors' rating of students' proficiency in sending spot reports							
Exercise	1	.46	.46	1.67			
Error	23	6.34	.28				
Battle	1	1.67	1.67	5.16*			
Exercise X battle	1	.29	.29	.90			
Error	23	7.46	.32				
* p <.05		** p <.01					
Means and standard deviations for instructors' rating of students' proficiency in sending spot reports							
		Battle 1		Battle 2		Combined	
Exercise	n	M	SD	M	SD	M	SD
Defensive	11	2.80	.46	3.32	.77	3.06	.40
Offensive	14	3.14	.48	3.36	.47	3.25	.35
Combined	25	2.99	.49	3.34	.60	3.17	.38

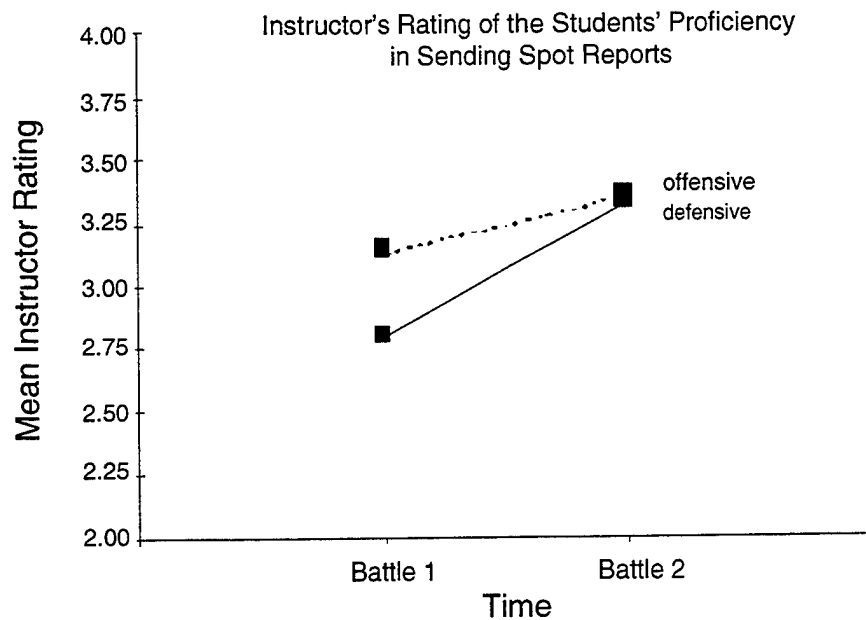


Figure 20. Instructors' rating of the students' proficiency in sending spot reports.

Instructors' Rating of Students' Ability to Send Timely Spot Reports

When asked to "Rate the timeliness of [the spot] reports," the instructors did not indicate that the students improved from the morning battles to the afternoon battles or from the defensive exercise to the offensive exercise. The 2 (battle: first battle versus second battle) by 2 (exercise: defensive versus offensive) repeated measures ANOVA performed to the average of the two company FSO instructors' responses did not reveal any significant main effects or an interaction. See Table 43 for the source table, means, and standard deviations.

Table 43

Source Table and Means and Standard Deviations for Instructors' Rating of the Timeliness of Spot Reports

Effect	df	SS	MS	F
Source table for instructors' rating of the timeliness of spot reports				
Exercise	1	.64	.64	1.82
Error	23	8.09	.35	
Battle	1	1.18	1.18	3.08
Exercise X battle	1	.07	.07	.19
Error	23	8.80	.38	

* $p < .05$

** $p < .01$

Means and standard deviations for instructors' rating of the timeliness of spot reports

	n	Battle 1			Battle 2		Combined	
		M	SD		M	SD	M	SD
Exercise								
Defensive	11	2.66	.56		3.05	.78	2.85	.45
Offensive	14	2.96	.57		3.20	.51	3.08	.39
Combined	25	2.83	.58		3.13	.63	2.98	.43

Instructors' Rating of Students' Performance in Updating Spot Reports

A 2 (battle: first battle versus second battle) by 2 (exercise: defensive versus offensive) repeated measures ANOVA performed to the average of the two company FSO instructors' responses to "Rate the team's performance at updating spot reports" revealed a significant effect for battle, $F(1,23) = 5.05, p < .04$. See Table 44 and Figure 21 for the source table, means, and standard deviations. The instructors believed that the officers were more proficient in updating spot reports during the second battle of the day than during the morning battle, M -morning = 2.61; M -afternoon = 3.05.

Table 44

Source Table and Means and Standard Deviations for Instructors' Rating of Students' Performance in Updating Spot Reports

Effect	df	SS	MS	F
Source table for instructors' rating of students' performance in updating spot reports				
Exercise	1	.46	.46	1.35
Error	23	7.78	.34	
Battle	1	2.36	2.36	5.05*
Exercise X battle	1	.05	.05	.10
Error	23	10.73	.47	

* $p < .05$ ** $p < .01$

Means and standard deviations for instructors' rating of students' performance in updating spot reports

	n	Battle 1		Battle 2		Combined	
		M	SD	M	SD	M	SD
Exercise							
Defensive	11	2.48	.53	2.98	.71	2.73	.42
Offensive	14	2.73	.74	3.11	.52	2.92	.41
Combined	25	2.62	.66	3.05	.60	2.84	.41

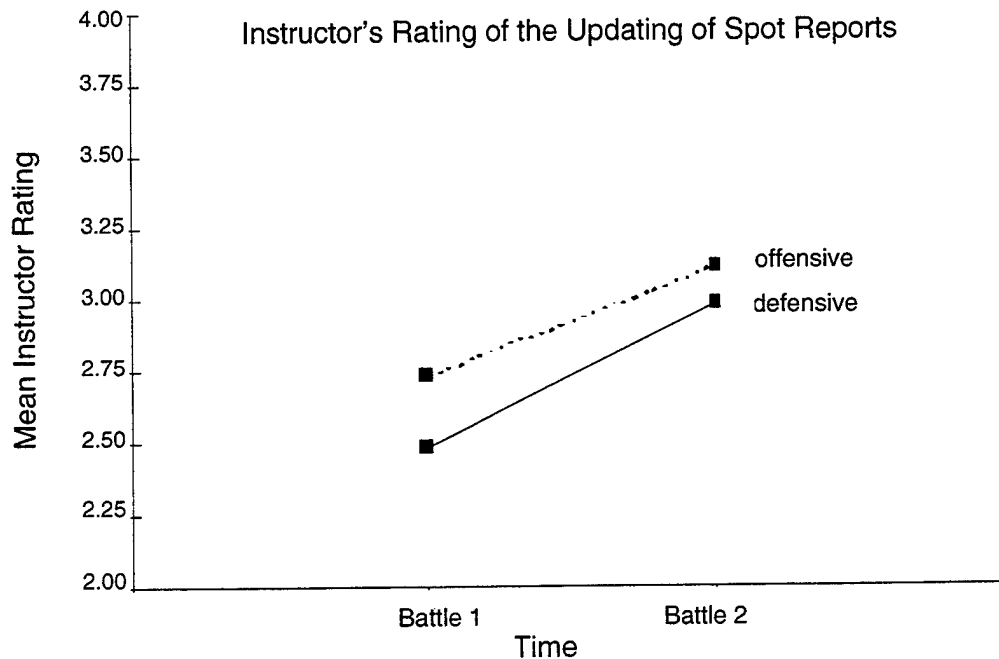


Figure 21. Instructors' rating of the updating of spot reports.

Instructors' Rating of Students' Ability to Update Situation Reports (SITREPS)

A similar pattern of results was found when instructors were asked to "Rate the FSO/team's performance at updating SITREPS." The 2 (battle: first battle versus second battle) by 2 (exercise: defensive versus offensive) repeated measures ANOVA performed to the average of the two company FSO instructors' responses revealed a significant effect for battle, $F(1,22) = 5.53, p < .03$. See Table 45 and Figure 22 for the source table, means, and standard deviations. The instructors believed that the officers were more proficient in updating SITREPS during the second battle of the day than during the morning battle, $M\text{-morning} = 2.91$; $M\text{-afternoon} = 3.40$.

Therefore, the instructors indicated that the students improved their performance in updating spot reports and SITREPS from the morning exercises to the afternoon exercises. They did not differentially rate the performance of groups performing offensive tasks from those performing defensive tasks.

Table 45

Source Table and Means and Standard Deviations for Instructors' Rating of Students' Ability to Update SITREPS

Effect	df	SS	MS	F
Source table for instructors' rating of students' ability to update SITREPS				
Exercise	1	.03	.03	.09
Error	22	8.36	.38	
Battle	1	2.88	2.88	5.53*
Exercise by battle	1	.13	.13	.24
Error	22	11.43	.52	
* $p < .05$			** $p < .01$	

Means and standard deviations for instructors' rating of students' ability to update SITREPS

Exercise	n	Battle 1		Battle 2		Combined	
		M	SD	M	SD	M	SD
Defensive	10	2.83	.64	3.43	.76	3.13	.35
Offensive	14	2.98	.59	3.38	.71	3.18	.48
Combined	24	2.92	.60	3.40	.71	3.16	.43

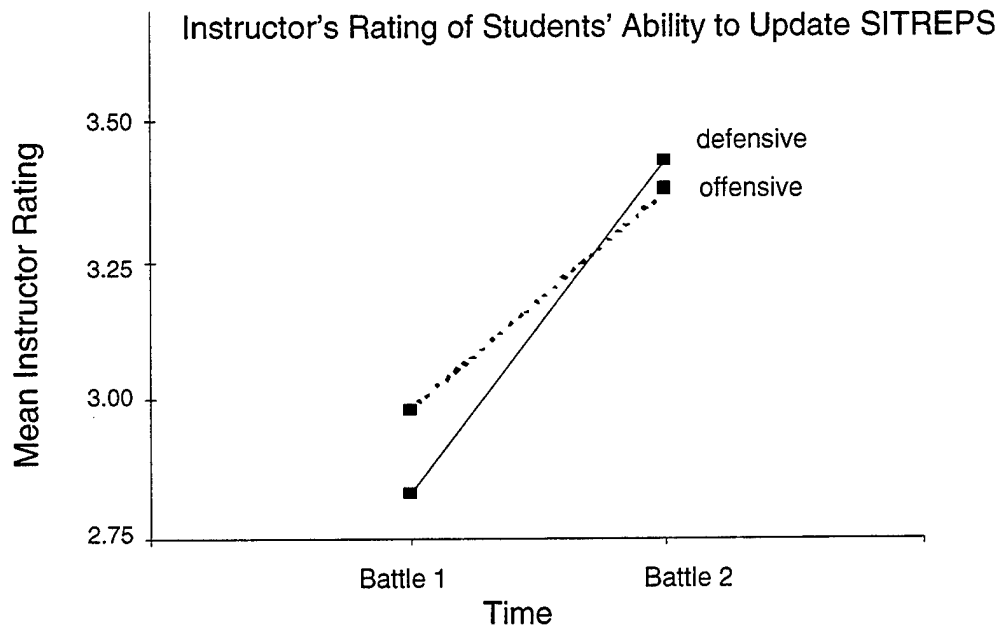


Figure 22. Instructors' rating of students' ability to update SITREPS.

Students' Rating of Their Ability to Generate SITREPS

A 2 (battle: before the first battle began versus after the second AAR) by 2 (exercise: defensive versus offensive) repeated measures ANOVA with the response to "My proficiency at generating SITREPS that paint an accurate picture of the battle (as I can see it from my location) is _____," revealed significant effects for battle, $F(1,403) = 172.52, p < .01$, and exercise, $F(1,403) = 23.02, p < .01$. See Table 46 and Figure 23 for the source table, means, and standard deviations. Once again, before the first experience with Janus, students' confidence level for generating SITREPS was its lowest ($M = 3.09$). After two battles and two defensive AARs were completed, the confidence rating increased to a moderate level ($M = 3.74$). About 3 weeks later, when the officers were brought back into the facility, the confidence level had not changed from the moderate level ($M = 3.43$). After the two additional battles and two offensive AARs, the confidence level reached its highest level ($M = 4.03$ on a 5-point scale).

Table 46

Source Table and Means and Standard Deviations for Students' Rating of
Their Ability to Generate SITREPS

Effect	df	SS	MS	F
Source table for students' rating of their ability to generate SITREPS				
Exercise	1	19.90	19.90	23.02**
Error	403	348.50	.86	
Battle	1	78.49	78.49	172.52**
Exercise X battle	1	.12	.12	.27
Error	403	183.36	.45	
		* p <.05		
		** p <.01		

Means and standard deviations for students' rating of their ability to generate SITREPS

Exercise	n	Battle 1		Battle 2		Combined	
		M	SD	M	SD	M	SD
Defensive	213	3.09	.86	3.74	.82	3.42	.66
Offensive	192	3.43	.81	4.03	.75	3.73	.65
Combined	405	3.25	.85	3.88	.80	3.57	.68

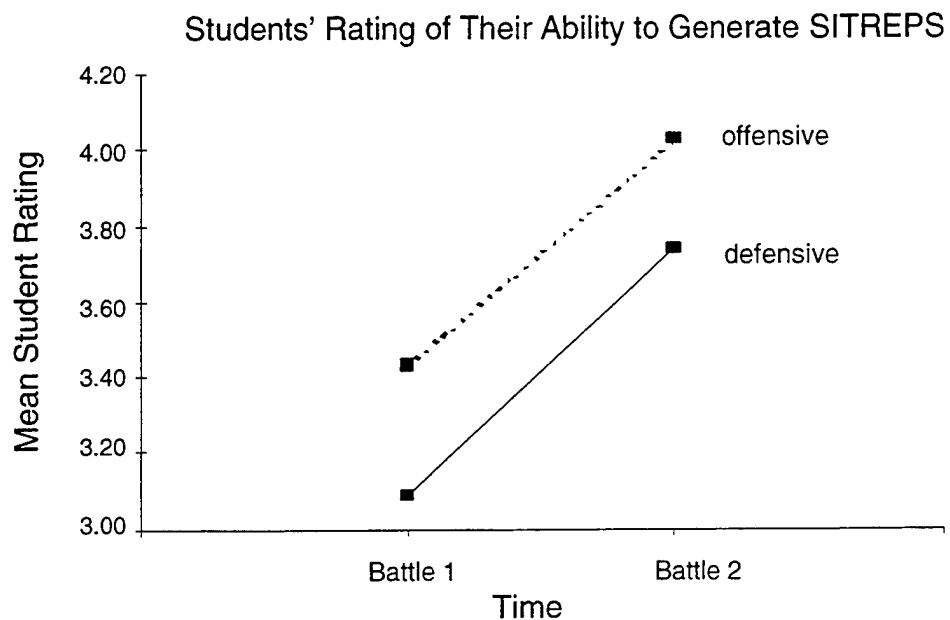


Figure 23. Students' rating of their ability to generate SITREPS.

Students' Rating of Their Ability to Use Updated Information

A 2 (battle: before the first battle began versus after the second AAR) by 2 (exercise: defensive versus offensive) repeated measures ANOVA with the response to "My proficiency at using updated information as it is relayed to me is ____" revealed significant effects for battle, $F(1,405) = 135.79, p < .01$, and exercise, $F(1,405) = 19.62, p < .01$. See Table 47 and Figure 24 for the source table, means, and standard deviations. Once again, before the first experience with Janus, students' confidence level for using updated information was at its lowest ($M = 3.20$). After two battles and two defensive AARs were completed, the confidence rating increased to a moderate level ($M = 3.66$). About 3 weeks later, when the officers were brought back into the facility, the confidence level had not changed from the moderate level ($M = 3.46$). After the two additional battles and two offensive AARs, the confidence level reached its highest level ($M = 3.93$ on a 5-point scale).

Table 47

Source Table and Means and Standard Deviations for Students' Rating of Their Ability to Use Updated Information

Effect	df	SS	MS	F
Source table for students' rating of their ability to use updated information				
Exercise	1	14.82	14.82	19.62**
Error	405	305.97	.76	
Battle	1	45.17	45.17	135.79**
Exercise X battle	1	.00	.00	.00
Error	405	134.71	.33	
	* $p < .05$		** $p < .01$	

Means and standard deviations for students' rating of their ability to use updated information

	n	Battle 1			Battle 2		Combined	
		M	SD		M	SD	M	SD
Exercise								
Defensive	215	3.20	.78		3.67	.76	3.43	.64
Offensive	192	3.46	.71		3.94	.68	3.70	.59
Combined	407	3.32	.76		3.79	.74	3.56	.63

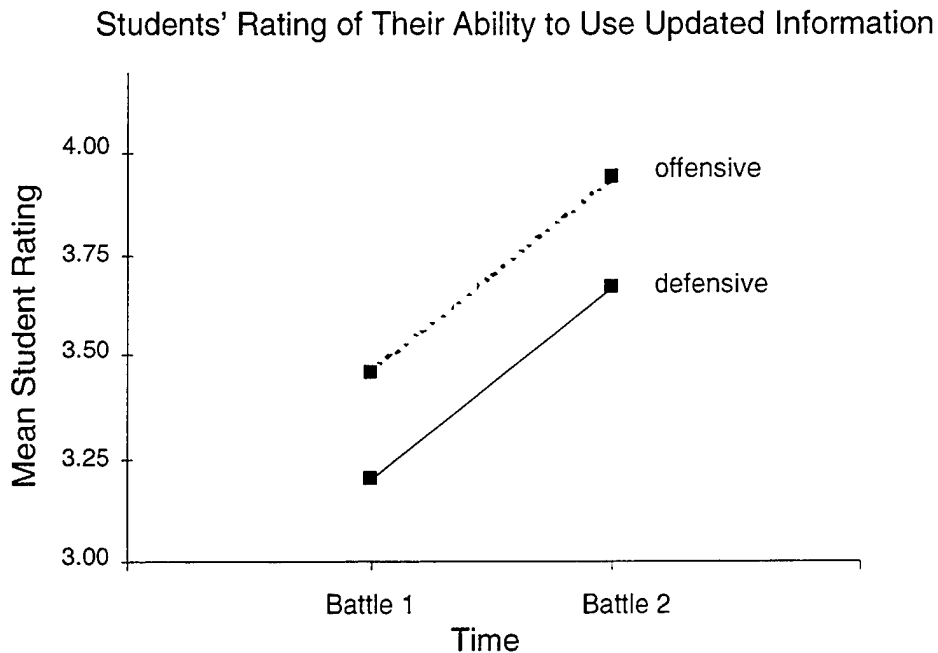


Figure 24. Students' rating of their ability to use updated information.

Summary: Effectively Use Priority of Fires and the Clearance of Fires

The students indicated that they were able to designate priority fires better after the afternoon exercise than before the morning exercise. The officers' performance in updating information and using updated information was superior in the afternoon exercise compared to the morning exercise. Both instructors and students noted the officers' improvement in performance in updating spot reports and SITREPS. Students indicated more confidence with their ability to generate SITREPS, relay information to the appropriate person, request a change in priority of fires, and use updated information with each experience with Janus.

Objective 7: Gain "Real Time" Experience in Planning, Coordinating, and Executing FS in Conjunction with Maneuver Forces

Through involvement with the Janus battles, the officers gain "real time" experience in planning, coordinating, and executing FS in conjunction with maneuver forces. Thus, this objective is automatically met.

Objective 8: Gain Experience and Appreciation for the Command, Control, and Coordination Relationships Among the Company Commander, the Company FSO, and the Battalion FSO

Once again, through the involvement of the Janus battles, the officers gain this experience; thus, this objective is met. However, a few subjective measures seemed appropriate.

Students' Rating of Their Ability to Relay Information to the Appropriate Person

A 2 (battle: before the first battle began versus after the second AAR) by 2 (exercise: defensive versus offensive) repeated measures ANOVA with the response to "My proficiency at relaying information to the appropriate person in a timely manner throughout the battle is ____" revealed significant effects for battle, $F(1,404) = 205.84, p < .01$, and exercise, $F(1,404) = 40.35, p < .01$. See Table 48 and Figure 25 for the source table, means, and standard deviations. Once again, before the first experience with Janus, students' confidence level for relaying information was at its lowest ($M = 2.97$). After two battles and two defensive AARs were completed, the confidence rating increased to a moderate level ($M = 3.79$). About 3 weeks later, when the officers were brought back into the facility, the confidence level had not changed from the moderate level ($M = 3.52$). After the two additional battles and two offensive AARs, the confidence level reached its highest level ($M = 4.01$ on a 5-point scale). In addition, an interaction was found, $F(1,404) = 13.77, p < .01$. The improvement from the morning to the afternoon battle in the students' perceived ability to relay information to the appropriate person for the first exercise (the defensive exercise) was more dramatic than the improvement from the morning to the afternoon battle for the second (offensive) exercise, $D\text{-defensive} = .83$; $D\text{-offensive} = .48$.

Table 48

Source Table and Means and Standard Deviations for Students' Rating of Their Ability to Relay Information to the Appropriate Person

Effect	df	SS	MS	F			
Source table for students' rating of their ability to relay information to the appropriate person							
Exercise	1	29.93	29.93	40.35**			
Error	404	299.62	.74				
Battle	1	86.41	86.41	205.84**			
Exercise X battle	1	5.78	5.78	13.77**			
Error	404	169.60	.42				
* p <.05		** p <.01					
Means and standard deviations for students' rating of their ability to relay information to the appropriate person							
		Battle 1		Battle 2		Combined	
Exercise	n	M	SD	M	SD	M	SD
Defensive	214	2.97	.82	3.79	.75	3.38	.60
Offensive	192	3.52	.76	4.01	.71	3.76	.62
Combined	406	3.23	.84	3.89	.74	3.56	.64

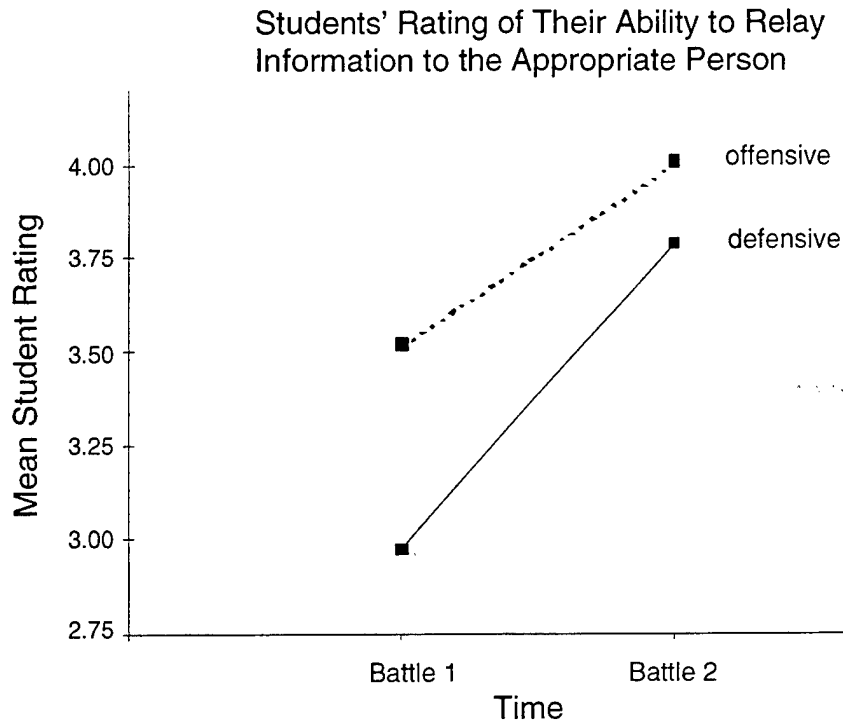


Figure 25. Students' rating of their ability to relay information to the appropriate person.

Students' Rating of Their Ability to Coordinate FS

Similar results were found when students were asked to rate their proficiency in coordinating FS in synchronization with maneuver. The 2 (battle: before the first battle began versus after the second AAR) by 2 (exercise: defensive versus offensive) repeated measures ANOVA revealed significant effects for battle, $F(1,406) = 235.55, p < .01$, and exercise, $F(1,406) = 38.80, p < .01$. See Table 49 and Figure 26 for the source table, means, and standard deviations. Students were more confident after the second AAR of the day than before performing any battles that day, and officers performing the second exercise (i.e., the offensive exercise) felt more confident than those performing the first exercise. In addition, there was an interaction between the two variables, $F(1,406) = 4.16, p < .05$, so that the difference in proficiency in the ability to coordinate FS synchronization with maneuver between the offensive and defensive exercise was greater before the morning exercise was performed than after the afternoon exercise was performed.

Table 49

Source Table and Means and Standard Deviations for Students' Rating of Their Ability to Coordinate FS

Effect	df	SS	MS	F
Source table for students' rating of their ability to coordinate FS				
Exercise	1	26.17	26.17	38.80**
Error	406	273.89	.67	
Battle	1	73.36	73.36	235.55**
Exercise X battle	1	1.30	1.30	4.16*
Error	406	126.44	.31	
* p < .05				** p < .01

Means and standard deviations for students' rating of their ability to coordinate FS

	n	Battle 1		Battle 2		Combined	
		M	SD	M	SD	M	SD
Exercise							
Defensive	216	2.93	.73	3.61	.67	3.27	.57
Offensive	192	3.36	.71	3.89	.69	3.63	.59
Combined	408	3.13	.75	3.74	.70	3.44	.61

Students' Rating of Their Ability to Coordinate Fire Support

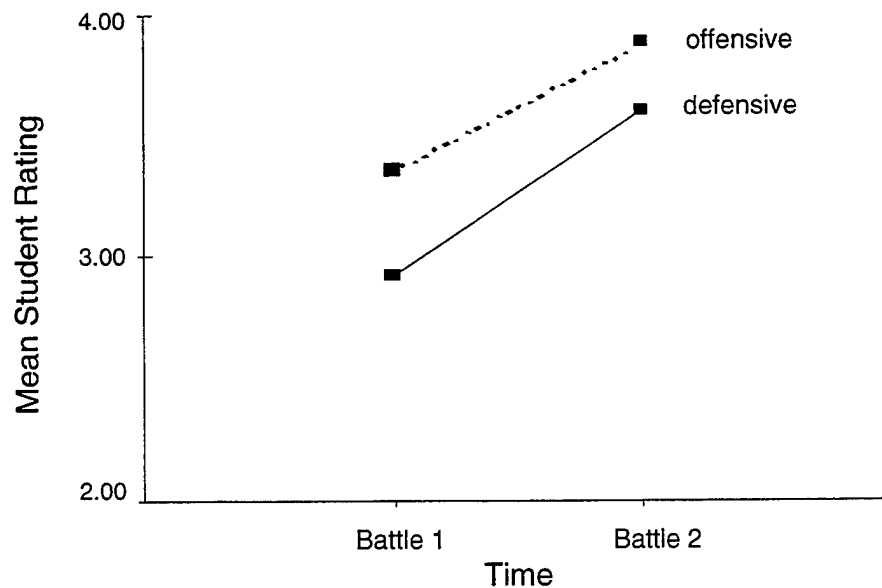


Figure 26. Students' rating of their ability to coordinate FS.

Objective 9: Develop and Use the FS Execution Matrix

When asked to rate their proficiency at using the FS execution matrix, officers indicated more proficiency after the second AAR than before the two Janus battles of the day and more proficiency when performing the offensive exercise than when performing the defensive exercise. The 2 (battle: before the first battle began versus after the second AAR) by 2 (exercise: defensive versus offensive) repeated measures ANOVA revealed significant effects for battle, $F(1,405) = 145.23, p < .01$, and exercise, $F(1,405) = 26.06, p < .01$. See Table 50 and Figure 27 for the source table, means, and standard deviations. Inspection of the means reveals a pattern consistent with the hypothesis that each experience with Janus increases student confidence. Before the first experience with Janus, the confidence level is at its lowest ($M = 3.15$). After two battles and two defensive AARs were completed, the confidence rating increased to a moderate level ($M = 3.70$). About 3 weeks later, when the officers were brought back into the facility, the confidence level had not changed from the moderate level ($M = 3.52$). After the two additional battles and two offensive AARs, the confidence level reached its highest level ($M = 3.97$ on a 5-point scale).

Table 50

Source Table and Means and Standard Deviations for Students' Rating of the Development and Use of the FS Execution Matrix

Effect	df	SS	MS	F			
Source table for students' rating of the development and use of the FS execution matrix							
Exercise	1	20.97	20.97	26.06**			
Error	405	325.96	.80				
Battle	1	51.44	51.44	145.23**			
Exercise X battle	1	.42	.42	1.17			
Error	405	143.45	.35				
* p <.05			** p <.01				
Means and standard deviations for students' rating of the development and use of the FS execution matrix							
		Battle 1		Battle 2		Combined	
Exercise	n	M	SD	M	SD	M	SD
Defensive	215	3.15	.84	3.70	.75	3.42	.65
Offensive	192	3.52	.74	3.97	.70	3.74	.62
Combined	407	3.32	.82	3.83	.74	3.57	.60

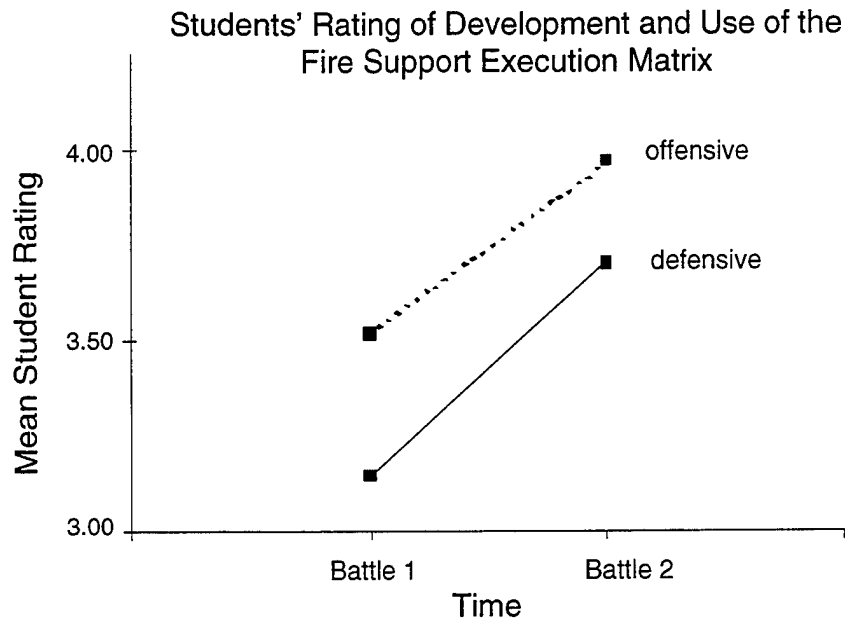


Figure 27. Students' rating of the development and use of the FS execution matrix.

Summary of Study 3

Through interviews with OBC instructors, objectives for the Janus experience were identified. All basic instructors were asked to rate, on a Likert-type scale ranging from (1) "very trivial," to (7) "very important," the extent to which they believed each identified objective was important. Nine objectives were identified as being very important (i.e., rating a 6.00 or higher on the 7-point scale): (1) develop and execute a company FS plan; (2) prepare and deliver a company FS briefing; (3) effectively plan and execute trigger points; (4) build confidence in students' abilities to plan and execute FS; (5) experience students' role as a company FSO (or a member of the company FIST); (6) effectively use priority of fires and the clearance of fires; (7) gain "real time" experience in planning, coordinating, and executing FS in conjunction with maneuver forces; (8) gain experience and appreciation for the command, control, and coordination relationships between the company commander, the company FSO, and the battalion FSO; and (9) develop and use the FS execution matrix.

Students participated in two battalion-level defensive exercises and 3 weeks later, two offensive exercises. In all battles, students played the roles of company FSO, FS Sgt, FS Spec, RTO, and possibly, a TF FSO. Paper-and-pencil tests were administered to students before the Janus exercise began and after the second AAR on the days when the defensive and offensive battles were simulated. In addition, instructors were asked to complete questionnaires after each battle. The overwhelming pattern of results is clear. For most measures, the officers'

proficiency at meeting the nine objectives increases with each Janus experience. Before the first experience with Janus, students' confidence level and the instructors' ratings of the student performance were often at their lowest. The instructors often rated the officers' performance to be superior in the afternoon battle relative to the morning battle. After two battles and two defensive AARs were completed, the confidence rating of the students increased to a moderate level. About 3 weeks later, when the officers were brought back into the facility, the confidence level had not changed from the moderate level. After the two additional battles and two offensive AARs, the students' rating of proficiency reached its highest level. Thus, it appears that the Janus experience does provide the skills and experiences, which the instructors deem important, to the basic course students.

CONCLUSIONS AND IMPLICATIONS

The purpose of this study was to ascertain the extent to which the Janus battle simulation system exercises help train the OBC students. Results from the three studies led to four conclusions.

Identification of Learning Objectives

It is clear that the Janus training objectives for USAFAS OBC students can be identified and agreed on by course instructors. When instructors were asked to rate the importance of several objectives on a 7-point Likert scale, a consensus was clearly evident. Most standard deviations were less than 1.

Validity and Reliability of Objective Process Measures

Many of the objective process measures proved to be problematic for many reasons. First, some of the performance measures were artificially inflated or deflated because of the simulation characteristics. If the developers of future versions of Janus work closely with instructors and researchers in order to diminish these "side effects," then as the Janus program evolves, many of these characteristics will be eliminated.

Second, instructor variability makes it nearly impossible to examine performance. Some instructors take a much more active role than others; some allow their officers to make mistakes; others intervene. This variability must be removed in order for researchers to measure and compare students' performance. One way to achieve this goal is to provide instructors with a

training program which specified the activities which are deemed appropriate for instructors. For example, the program should identify the appropriate level of intervention to be made by instructors.

Third, the ability of the simulation interactors varied because of the level of experience and training. Perhaps an effort could be made to give instructors practice time so that each has a similar ability level.

When these measures are improved, their reliability and validity should be ascertained. Measures should be modified until all reach acceptable levels of reliability and validity. At that time, questions concerning the relationship between battle performance with Janus and "real world" battle performance must be pondered and answered.

Until the objective measures are improved, researchers will be left with the alternative of using self-report measures and subjective ratings, as in Study 3.

Relationship Between Objective Process Measures and Outcome Variables

The variables used to assess battle outcome (e.g., FER, SMFRD), which are easily obtained from JAWS, were **not** correlated with the objective measures developed from the identified learning objectives. This is not surprising, given the fact that the OBC course focuses on the process of battle command and not on battle outcome. Factors other than process variables can affect battle outcome (e.g., luck or the opponent's ability).

However, the relationship between the process and outcome variables will not be clear until the objective measures are improved. When these measures are improved, this relationship should be re-evaluated.

Subjective Ratings

The subjective measures led to a clear pattern of findings. The officers rated their proficiency at meeting the learning objectives more favorably with each Janus experience. Their confidence was at its lowest before the first Janus experience. It increased from the first defensive battle to the second defensive battle. Little change took place during the class time between the second defensive battle and the first offensive battle. Increases from the first to the second offensive battle were dramatic. Instructors' ratings were similar. For most measures, performance was thought to increase from the first battle of the day to the second.

In summary, it is clear that the officers' experiences with Janus helped them to feel more confident. Subjective measures from instructors also indicate that the officers' performance improves. However, it is premature to conclude that the Janus experience is useful in improving battle performance. Until instructor variability is limited and some of the artifacts of Janus removed, we cannot be sure the extent to which performance is affected by the officers' experience with the Janus battle simulation system exercises.

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APPENDIX A
OPORD FOR DEFENSIVE EXERCISE

OPORD FOR DEFENSIVE EXERCISE

US ARMY FIELD ARTILLERY SCHOOL
Fire Support and
Combined Arms Operations Department
Fort Sill, Oklahoma 73503

TI02BG
H01
JAN 96

Copy no. ___ of ___ copies
1-4 AR, 2d-Bde, 52d Div
Fort Sill (NP522385) OK
___ 1700 ___ 19 ___
WAB4

OPORD TOMAHAWK A

Reference: Map, Ft Sill Range, 2-DMA, 1:50,000.

Time zone used throughout the order: Sierra.

Task organization, TF 1-4 Armor

TM A
A/1-78 Mech(-)
I/C/1-4 Armor

TM C
C/1-4 Armor(-)
1/A/1-78 Mech

TM D
D/1-4 Armor(-)
1/A/1-79 Mech

TM MECH
A/1-79 Mech(-)
1/D/1-4 Armor

TF CONTROL

Scout Platoon

COLT

Heavy Mortar Platoon

1/B/1-441 ADA (S) (DS)

A/52 Eng (DS)

B/52 Eng (OPCON)

1. SITUATION

a. Enemy Forces. (See Annex A, Enemy Sketch).

1) 2nd BDE is opposed by the 13th MRD of the 4th CAA. The 13th MRD is conducting a supporting attack for the 18th MRD that is attacking to our east in 3rd BDE's sector. The 4th CAA's objective is to secure the ALTUS airfield complex to support his future operations. The enemy is approximately 95% strength. The division is BMP-2/T-72 equipped. Morale is high.

2) The enemy is currently occupying hasty defensive positions vicinity Oklahoma City. They are capable of resuming offensive action within 48 hours. Given moderate success of the covering force, we expect the enemy in our sector within 60 hours. Air parity exists, however, the enemy is capable of achieving local air superiority. The enemy is nuclear and chemical capable, but has not employed them to date. The enemy is capable of conducting battalion size air assault operations.

3) TF 1-4 AR can expect to be attacked by elements of the 49th MRR (BMP-2/T-72) which is making the 13th MRD's main attack. We expect the regiment to attack with 2 MRBs up and 1 back, with the tank company from the third MRB possibly held pure as the Regimental reserve, along avenue of approach C, initially following parallel to HWY 62 and then swinging to the southwest towards Four Mile Crossing (See Annex A, Enemy Sketch). The regimental intermediate objective is to secure crossing sites along Medicine Creek and its subsequent objective is the TF's rear boundary (vicinity Sheridan road). The enemy's most dangerous course of action is to mass on AOA C and push due south for White Wolf and Quinette Crossings.

4) Weather. Temperature range 60-80. Chance of precipitation is negligible. Winds are from the NE at 2-8 kmph.

5) Terrorist. We expect Level I and Level II threat in the Lawton/ Fort Sill area.

b. Friendly Forces.

1) 2d Bde defends in sector from NP421437 to NP569401 to destroy the 13th MRD. The Bde commander intends to destroy the enemy well forward of PL WOLF to give 1st BDE sufficient space to move across our rear to their LD for the Division's counter attack. The BDE must preserve enough combat power to defend against follow on forces. Two TFs will defend in sector to destroy the enemy forward. One TF will be held in reserve. Successful conclusion will see the BDE defending along PL DUBLIN with 70% of its combat power intact.

2) 1-52 CAV conducts covering force operations from NP4260 to NP5960 between PLs ROME and DUBLIN and destroys the Advance Guard of the 13th MRD.

3) TF 1-79 Mech, to our west, defends in sector from NP421437 to NP511425, to protect brigade left flank, defeat supporting attacks and allows no penetration of PL WOLF.

4) 3d Bde, in the east, the division main effort, defends in sector from NP569401 to NP672359, to defeat the 18th MRD.

5) TF 1-78 is the brigade reserve and occupies AA DENVER, vicinity NP508338. On order counterattacks to destroy all remaining elements of the 13th MRD.

6) 1st Bde the division's reserve, counterattacks to complete the destruction of the 18th MRD forward of PL DUBLIN.

c. Attachments and Detachments. See Task Organization.

2. MISSION

TF 1-4 Armor defends in sector, as the BDE main effort, NLT 1200 19 from NP511425 to NP569401 to destroy the 49th MRR forward of PL WOLF to prevent disruption of 1st Brigade's counterattack,

3 EXECUTION

My intent is to destroy the 49th MRR in EA HOT to facilitate 1st Bde's movement across our rear into their counterattack. Initially, we will disrupt enemy reconnaissance assets forward of PL PARIS. The key to our success is separating the two echelons so we can defeat the first before dealing with the second. I want to ensure the enemy comes into EA HOT from AOA C and turns towards the Southwest. We will destroy the enemy using well synchronized direct and indirect fires supported by

OPORD TOMAHAWK A, TF 1-4 AR, 2D BDE, 52 ID (MECH)

engineer efforts. The successful conclusion to this operation will leave the TF defending along PL DUBLIN with at least 50% of our force intact.

a. Concept of the operation. (See Annex C, Operations Overlay).

1) Maneuver. This operation consists of four phases.

Phase I: Phase I is the establishment of the defense. Tm Mech is the main effort. The TF establishes a defense in sector between PL PARIS and PL WOLF. The TF Scouts establish a screen line north of PL DUBLIN on AOA C and establish Link-up Point I (LPI). The company/Tms establish BPs 10, 20, 30, and 40 south and southwest of EA HOT. Two Tms establish platoon size ambushes forward of PL DUBLIN to conduct counter-reconnaissance. Another team establishes a platoon size battle position forward to guard PP 2 in order to support the withdrawal of elements of the 1-52 CAV. Phase I is complete when all TF elements are in position and prepared to accept battle handover.

Phase II: Phase II is the battle handover and withdrawal of forward elements. Tm Mech is the main effort. Tms Mech, D, C, A defend BPs 10, 20, 30, and 40 respectively. The TF scouts conduct link-up with 1-52 CAV at LPI and provide guides to PP2. The two ambush platoons forward accept battle handover and disrupt the enemy's forward reconnaissance and, o/o, displace back to their respective Tm BPs. At the completion of the passage of 1-52 CAV, the platoon vicinity PP2 will displace back to BP 40. Phase II is complete when 1-52 CAV has completed BHO and withdrawn through PP2 and all forward platoons have withdrawn South of PL DUBLIN.

Phase III: Phase III is the destruction of the 49th MRR in EA HOT. Tm C is the main effort. Tm C, as the TF Main Effort, defends BP 30 to destroy the 49th MRR in EA HOT to prevent disruption of 1st Brigade's counterattack. Tms D and Mech, as supporting efforts, destroy lead battalions of the 49th MRR to prevent concentration of combat power against the main effort. O/O, Tm D displaces to BP 21 to destroy enemy in EA HOT to prevent the bypass of the main effort. Tm A, as a supporting effort, defends BP 40 to destroy elements of the 49th MRR in EA HOT to prevent disruption of 1st Brigade's counterattack. TF Scouts continue surveillance along the northern screen line and establish screen along our western boundary to provide early warning of enemy activity along AOA A. Phase III is complete with the destruction of the 49th MRR in EA HOT.

Phase IV: Phase IV is the re-establishment of the defense and the preparation for future operations. Tm Mech is the main effort. TF scouts consolidate along northern screen line. company/Tms reestablish Bps 10, 20, 30, and 40 and prepare for future operations.

2) Fires. Annex D (Fire Support Execution Matrix). Indirect fires will be used to disrupt and delay the enemy prior to the first echelon entering EA HOT and to suppress direct fire systems inside the engagement area. Screening smoke will be used to facilitate the withdrawal and repositioning of the ambush platoons. During PHASE I and II, both mortar and FA priority is to the TF Scouts. TF Scouts provide indirect fires to disrupt the lead MRBs advancement and to support 1-52 CAV's rearward passage of lines. During PHASE III, FA POF shifts to TM C and mortar POF to TM D. Use obscuration smoke to disrupt the first echelon's anti-tank systems as they attempt to breach the first obstacle belt. TF COLT co-locates with the Scouts to assist in the acquisition of targets in the 2nd echelon and tank reserve. Priority of CPHD to TF COLT for use against the second echelon. CAS control is retained at TF level with the priority of commitment to destroying the 2nd echelon and tank reserve prior to their entering EA HOT. Use of FASCAM is planned to reinforce existing obstacles on AOA C and to disrupt 2nd echelon forces.

OPORD TOMAHAWK A, TF 1-4 AR, 2D BDE, 52 ID (MECH)

3) Air Defense Operations. Priority is protection to the MBA, CP and trains. The weapon control status is TIGHT and air defense warning is YELLOW.

4) Intelligence. Priority of collection to identify the enemy main effort into sector, enemy breaching sites at the obstacles in EA HOT, then to early identification of enemy 2nd echelon and reserves.

5) Engineer. (See Annex E, Engineer Overlay). Priority of personnel effort to counter mobility and priority of equipment effort to survivability.

Priority of counter-mobility work to canalize enemy into EA HOT and block escape routes from EA. Priority of survivability to BPs 30, 20, 10, 40, and 21 in order. Priority within BP's to M-2s, FIST-V and M-1s in order. Priority to mobility for the withdrawal of the ambush platoon from TM MECH and to improving the routes for the shifting of TM D. Brigade has short duration FASCAM employment authority. One high density 400 x 400 meter FASCAM field is planned to reinforce existing obstacles on AOA C.

b. Tasks to Maneuver Units. (See Annex D, Maneuver Execution Matrix).

1) TM A.

a) Defend BP 40 oriented from TRP 05 to TRP 07.

b) Defend BP 4A with dismounted infantry to block AOA B.

c) Occupy BP 41 with a platoon size element and establish PP2.

d) Coordinate with the TF scouts for passage of elements of 1-52 CAV through PP2.

e) 0/0, withdraw from BP 41 to BP 40 and close PP2.

2) TM C.

a) Defend BP 30 oriented from TRP 07 to TRP 06.

b) Defend BP 3A with dismount infantry to block escape of enemy from EA HOT towards the northwest.

c) Establish platoon size BP 31 to disrupt enemy reconnaissance elements.

d) 0/0 displace from BP 31 to BP 30.

3) TM D.

a) Defend BP 20 oriented from TRP 06 to TRP 04.

b) Defend BP 2A with dismount infantry oriented from TRP 06 to TRP 04.

c) During Phase III, on-order displace to BP 21 to complete the destruction of enemy forces in EA HOT.

OPORD TOMAHAWK A, TF 1-4 AR, 2D BDE, 52 ID (MECH)

4) TM MECH.

- a) Coordinate with 3d Bde at PL Dublin.
- b) Defend BP 10 oriented from TRP 06 to TRP 04.
- c) Defend BP 1A with dismount infantry oriented from TRP 07 to TRP 04.
- d) Establish BP 11 with a platoon size element to disrupt enemy reconnaissance elements.
- e) 0/0, withdraw from BP 11 to BP 10.

5) Scouts.

- a) Coordinate with 3d Bde at PL Paris.
 - b) During Phase I. establish LP1.
 - c) Coordinate with Tm A and 1-52 CAV for rearward passage through PP2. Reconnaissance passage lane from LP1 through PP2 to RP3.
 - d) Establish screen along AOA C.
 - e) Establish dismount OPs at OP1 and OP2 and construct hide positions for vehicles there.
 - f) Conduct linkup with 1-52 CAV and guide through sector to RP3.
 - g) At the conclusion of BHO, collapse screen along AOA C and displace to OP1 and OP2.
 - h) At the conclusion of passage, establish screen along AOA A.
- Provide security for COLT at OP1.

6) Mortar Platoon.

- a) Primary firing position vicinity NP543384.
- b) Alternate firing position vicinity NP526391.

c. Tasks to Combat Support Units.

1) Fire Support. (See Annex D, Fire Support Execution Matrix).

- a) Close Air Support. TF 1-4 AR has 4 CAS sorties. Priority for use against second echelon MRB and tank reserves in EA HOT.
- b) Chemical Support. (Omitted)

OPORD TOMAHAWK A, TF 1-4 AR, 2D BDE, 52 ID (MECH)

c) Field Artillery.

1 General. (See Annex F, Fire Support Execution Matrix).

2 Organization for combat.

52d (MECH) DIVARTY:

4-40 (155, SP) FA: R 5-40 FA o/o GSR 6-40 FA

5-40 (155, SP) FA: DS 2nd Bde

6-40 (155, SP) FA: DS 3d Bde

B/68 (MLRS) FA: GS

3 COLT co-locate with scouts at OP1.

d) Fire Support Coordination Instructions. The battalion target block is AB 2000-2999 (See Annex F, Fire Support Execution Matrix).

1) TF Smoke allocation:

TF: 5min/FA allocated to A2B

TM A: O/FA, 4min MTR

TM M: 4min/FA 6min/MTR

TM C: 3min/FA 4min/MTR

TM D: 3min/FA 6min/MTR

2) Air Defense. (Omitted).

3) Chemical. SOP.

4) Engineer. (Omitted).

d. Coordinating Instructions.

1) Task organization effective upon receipt.

2) Final ambush platoon locations and planned withdrawal routes will be reported to the TOC NLT ____0600 ____ 19____.

3) Priority Intelligence Requirements.

a) Employment of chemical and nuclear weapons.

b) Enemy tank formations of five vehicles or more.

c) Enemy helicopter over-flights.

d) Enemy breaching equipment or breaching operations.

OPORD TOMAHAWK A, TF 1-4 AR, 2D BDE, 52 ID (MECH)

- 4) Priority of friendly information requirements.
 - a) Ammo status under 50%.
 - b) Losses greater than 50%.
- 5) MOPP level II in effect ___1200___19___.
- 6) OEG is negligible risk to unwarned exposed personnel.
- 7) Anti-terrorism Actions. Barricade and man TF CP and trains entrances.

4. SERVICE SUPPORT (Omitted)

5. COMMAND AND SIGNAL

a. Command.

- 1) TF Cdr with TM D.
- 2) TF S-3 initially with TM C.
- 3) Main CP at NP 522394, then NP 515385.

b. Signal.

- 1) Current SOI in effect.
- 2) Radio-listening silence in effect. Silence lifted and SOI in effect upon passage of covering force.

ACKNOWLEDGE.

J. WAYNE
LTC

OFFICIAL:

C. EASTWOOD
S3

Annexes:

- | | | |
|---|---|-------------------------------|
| A | - | Enemy Sketch |
| B | - | Maneuver Execution Matrix |
| C | - | Operations Overlay |
| D | - | Fire Support Execution Matrix |
| E | - | Fire Support Overlay |
| F | - | Task Force Target List |
| G | - | Engineer Overlay |

Distribution: B

ANNEX C TO OPORD TOMAHAWK TF 1-4 ARMOR (OPERATIONS OVERLAY)

SEE

1:50,000 MAP

TI02BE
MAP
H01

ANNEX B TO OPORD TOMAHAWK, TF 1-4 ARMOR (MANEUVER EXECUTION MATRIX)

EVENT UNIT	PHASE I	PHASE II	PHASE III	PHASE IV
TF CONTROL	MRTS NB533393/ NB543387	MRTS DSPL SEC NB537383		
SCOUTS	SCREEN PL PARIS EST LP1	LU WITH 1-52 AT LP1 GUIDE TO PP2	ENGAGE 2D ECHELON W/ARTY	RE- ESTABLISH SCREEN, RECONSOLID
TM A	OCC BP40 EST PP2, BP 41, BP 4A	DSPL TO BP40 DEFEND BP 40, BP 4A	EA HOT	RE- ESTABLISH BP 40
TM C	OCC BP 30, 31, 3A	CNTERRECON DSPL TO BP30 DEFEND BP 30,	EA HOT	RE- ESTABLISH BP 30
TM D	OCC BP 20, 2A	DEFEND BP 20 BP 2A	EA HOT	RE- ESTABLISH BP 20
TM MECH	EST BP 11 OCC BP 10, 1A	CNTERRECON DSPL TO BP10 DEFEND BP10	EA HOT	RE- ESTABLISH BP 10

OPORD TOMAHAWK A, TF 1-4 AR, 2D BDE, 52 ID (MECH)

COMMANDER'S GUIDANCE

TEAM A, TF 1-4 AR

MISSION STATEMENT

Team A, TF 1-4 AR, as a supporting effort, Defends BP 40, NLT _____ to destroy elements of the 49th MRR in Order to prevent penetration of PL Wolf.

COMMANDER'S INITIAL CONCEPT

Team A will occupy BP 40 with two Mech platoons to the North and one Tank platoon to the South. The company/team fires will be oriented between TRP 05 and TRP 04. On order our right boundary will shift to TRP 07. All dismounts will be consolidated and positioned in BP 4A to block AOA B and protect our Northern flank. The center sector platoon will initially occupy BP 41 to guard passage point 2. On order, at the completion of the battle hand-over with the 1-52 CAV, forces in BP 41 will displace to their primary positions in BP 40.

COMMANDER'S GUIDANCE FOR FIRES

1. DO NOT SHOOT THE DISMOUNTS.... DO NOT SHOOT TEAM C's DISMOUNTS!
2. Plan a FPF.
3. Give priority of fires to the platoon in BP 41 until they displace.
4. Screen the displacement of the Mech platoon from BP 41 to BP 40.
5. Consider the use of illumination to assist the dismounts in BP 4A, for detection of enemy movement South along AOA B.

OPORD TOMAHAWK A, TF 1-4 AR, 2D BDE, 52 ID (MECH)

COMMANDER'S GUIDANCE

TEAM MECH, TF 1-4 AR

MISSION STATEMENT

Team Mech, TF 1-4 AR, as a supporting effort defends BP 10 NLT _____ to destroy lead elements of the 49th MRR in-order to prevent concentration of an organized Battalion or larger from concentrating combat power against the main effort.

COMMANDER'S INITIAL CONCEPT

Team Mech will occupy BP 10 with one Tank platoon in the center and Mech platoons on the flanks. The company/team fires will be oriented between TRP 06 and TRP 04. The dismounts will be consolidated and positioned in BP 1A to destroy elements attempting to breach the southern obstacle belt in EA HOT. The dismounts will be prepared to withdraw to BP 10, but will only displace on the orders of the team commander. Initially one Mech platoon will be deployed in BP 11 to disrupt elements of the enemy's reconnaissance effort. The disengagement criteria for this platoon is prior to the enemy reconnaissance elements reaching 2000 meters of BP 11.

COMMANDER'S GUIDANCE FOR FIRES

1. Screen the displacement of the forward platoon from BP 11 to BP 10.
2. Plan a FPF.
3. Mass fires in EA HOT to coincide with the company/team sector.
4. Consider the use of illumination in assisting the dismounts in covering the Southern obstacle belt.
5. Consider the ridge to our Northeast as a possible position for the enemy to deploy his flank security.

OPORD TOMAHAWK A, TF 1-4 AR, 2D BDE, 52 ID (MECH)

COMMANDER'S GUIDANCE

TEAM D, TF 1-4 AR

MISSION STATEMENT

Team D, TF 1-4 AR, as a supporting effort, Defends BP 20, NLT _____ to destroy elements of the 49th MRR in-order to prevent concentration of an organized Battalion or larger from massing combat power against the main effort. On-Order displaces to BP 21 to complete the destruction of the 49th MRR.

COMMANDER'S INITIAL CONCEPT

Team D, occupies BP 20 with one Mech platoon centered and two Tank platoons on the flanks. The company/team fires will be oriented between TRP 06 and TRP 04. The Mech platoon will dismount its dismounts in BP 2A to cover the Southern reverse slope of EA HOT. The dismounts are to be prepared to displace to BP 20, but will only do so on the order of the commander.

On-Order the company/team will displace to BP 21 to complete the destruction of the 49th MRR. We will do this by pulling platoons from the right to left and moving South of Snow Ridge. The two Tank platoons will move into BP 21 abreast and the Mech platoon will occupy high ground to our rear. All fires will be oriented between TRP 06 and TRP 07.

COMMANDER'S GUIDANCE FOR FIRES

1. DO NOT SHOOT MY DISMOUNTS!
2. Plan a FPF.
3. Plan to screen the displacement of the dismounts.
4. Screen our displacement to BP 21, it will take us four to five minutes to move out of BP 20 to the South of Snow Ridge.
5. Consider the use of illumination to assist the dismounts in observing the obstacle belt to their front.
6. Mass fires in EA HOT within the company's sector.

OPORD TOMAHAWK A, TF 1-4 AR, 2D BDE, 52 ID (MECH)

COMMANDER' GUIDANCE

TEAM C, TF 1-4 AR

MISSION STATEMENT

Team C, TF 1-4 AR, as the Main Effort, Defends BP 30 NLT_____ to destroy lead battalions of the 49th MRR in order to allow no penetration of PL WOLF, providing maneuver space for the 1st BDE counterattack.

COMMANDER'S INITIAL CONCEPT

Team C defends BP 30 with a Mech platoon in the North, and two Tank platoons in the South. The company/team will orient its fires from TRP 06 to TRP 07. The Mech platoon in the North dismounts its Infantry in BP 3A. The dismounts will remain in BP 3A to contain enemy attempting to escape the EA to the North.

The Mech platoon will initially occupy BP 31 to disrupt the enemies forward reconnaissance units. Disengagement criteria for BP 31 is when the forward reconnaissance units are within 2000 meters of that position. Once the Mech platoon breaks contact it will displace to its primary fighting positions in BP 30.

COMMANDER'S GUIDANCE FOR FIRES

1. Screen the displacement of the Mech platoon from BP 31 to BP 30.
2. Mass fires into EA HOT within the company's sector.
3. Plan a FPF.
4. Coordinate our fire plan with Team D to facilitate their on-order movement to BP 21.

APPENDIX B
OPORD FOR OFFENSIVE EXERCISE

OPORD FOR OFFENSIVE EXERCISE

CLASSIFICATION

TI02BD/OP/OX

HO #1

OPORD BOLD OX II, 2-14 Armor, 3d BDE, 32d AR Div

22 May '95

Copy _____ of _____
2-14 AR, 3d BDE, 32 AD
FT. Sill, (NP535188), OK
031500 JAN 9____
MLH

OPORD BOLD OX II

References: Map, edition 2-DMA, FT Sill, OK, 1:50,000

Time Zone Used Throughout the Order: Local

TASK ORGANIZATION: TF 2-14 Armor, 3d BDE, 32d AD

Team A

A/2-92 Mech(-)
1/B/2-14 AR

Team B

B/2-14 AR(-)
1/A/2-92 MECH
2/A/32 EN (+)

Team C

C/2-14 AR(-)
2/D/2-92 MECH
1/A/32 EN

Team D

D/2-92 MECH(-)
2/C/2-14 AR

Task Force Control

Scout Platoon

Heavy Mortar Platoon (GS, W/POF)

A/32 ENG (-) (DS)

1/C/2-440 ADA (BFSV) (DS)

2/4/B/1-440 ADA (Stinger)

1. SITUATION

a. Enemy Forces. Annex A (Enemy Sketch)

1) Elements of the 62 MECH BDE of the Samaran Army are conducting a deliberate defense in our brigade zone. The enemy is estimated at 65% strength with good morale. One battalion is in our zone. This unit is equipped with approximately 15 BMP-1's and 6 T-72's. Elements of the brigade reconnaissance company (Scorpion and Scimitar-equipped) are in zone. This brigade is supported by two D-30 batteries (DS), one D-20 battery and a battery of 120mm mortars. The regimental antitank reserve, an antitank battery(+), is located vic NP 6550 and can counterattack in our zone within 10 minutes. The division reserve, a tank battalion with MI-24 support, can counterattack in our zone within 45 minutes.

2) Due to well emplaced defensive positions and high morale, enemy forces are predicted to stand their ground and fight. If the defense is going well, the westernmost forces (near 03J BILLY) should be used to exploit success and move to engage friendly forces from the flanks if presented the opportunity. The easternmost forces in

CLASSIFICATION

CLASSIFICATION

OPORD BOLD OX II, 2-14 Armor, 3d BDE, 32d AR Div

OBJ JOHNSON should stay in position. If the defense starts to fail, the eastern force should withdraw north along the low ground to an area of consolidation along the Frisco Ridge. Their goal will most likely be to cause damage, delay and split friendly attacking forces as much as possible before attempting link-up with their larger forces to the north. The most dangerous course of action would be for enemy regimental forces to launch a spoiling attack from the east. Although unlikely because of probable failure, it would cause a great many friendly casualties.

3) Known enemy locations / obstacles are: (SEE Annex A, Enemy Sketch)

a) Two tank ditches located from NP630410 to NP600413, and NP584425 to NP 571433.

b) Two surface laid minefields located in and around the North ARBUCKLE impact area. The first minefield is from NP645423 to NP630412. The orientation is from southwest to northeast. The second minefield runs from NP568438 to NP60041

c) 3d BDE detected enemy dismounted movement at grid NP 618380 at 020300 JAN 9-. Enemy LP/OP's could operate along the ridge lines running from vic grid NP 6439 to the west along the 39 grid line.

d) One motorized rifle company (MRC) (BMP-1) is located at grid NP 620425 (center mass). Another MRC is located at grid NP 585445.

b. Friendly Forces.

1) 3d BDE attacks at 050700 JAN 9 to seize OBJ MANHATTAN (NP 660510) in support of the division's main attack. The commander intends to attack with two task forces (TF) abreast. TF 2-14 in the west attacks first to fix the enemy in the west and attempt to draw the enemy's reserve. TF 2-92 then attacks in the east to breach the enemy's defenses in the east and pass a third TF through to make the main attack to seize OBJ MANHATTAN (NP 660510). The mission ends when 3d BDE seizes OBJ MANHATTAN and enemy organized resistance has ceased.

2) 2-22 CAV screens the division's north western boundary between lakes Lawtonka & Ellsworth.

3) TF 2-92 IN (M), attacks in zone at 050730 JAN 9- to seize OBJ BROOKLYN (NP 700450) and becomes the brigade main effort.

4) TF 2-93 INF (M) conducts the brigade main attack on order to seize OBJ MANHATTAN.

c. Weather. Visibility is excellent. Temperatures will range from the low 40's during the day to the mid 20's at night. Winds are mild, blowing from the southeast to the northwest. No precipitation is expected for the next 72 hours.

d. Attachments and Detachments. See Task Organization.

CLASSIFICATION

CLASSIFICATION

OPORD BOLD OX II, 2-14 Armor, 3d BDE, 32d AR Div

2. **MISSION** TF 2-14 AR attacks along AXIS SLASH at 050700 JAN 9_ to destroy enemy forces vicinity OBJ JOHNSON (NP 600440) to protect the main effort's western flank

3. **EXECUTION**

My intent is to quickly seize our objective by fixing the enemy forces in the east, then rapidly penetrate with our main effort in the west. Our purpose is to protect the brigade main effort's western flank, and to draw the enemy's regimental reserve. The operation ends with the seizure of OBJ JOHNSON, and with the Task Force positioned to defeat any enemy counterattack.

a. Concept of the Operation. Annex B (Operations Overlay)

1) Maneuver.

a) Initially, the Task Force moves from AA BUTCH along ROUTES HOOK and JAB to attack positions short of the LD, PL COKE. We will use company columns for movement with the order of march being Teams C and D along route JAB, and A and B along route HOOK. The battalion headquarters will follow along route HOOK. SP time is 0600.

b) LD time is 050700 JAN 19 - . The task force attacks in a box formation along AXIS SLASH. In the east, TM C leads TM D, while in the west TM A leads TM B. TM A is the main effort prior to PL SLICE. The TF HQs and mortars move in the center of the box formation.

c) After crossing PL SLICE. Teams C, D, and A will move on line, east to west respectively, and occupy attack by fire (ABF) positions C-1, D-1, and A-1. TM B becomes the main effort and breaches the obstacle in the western portion of OBJ JOHNSON.

d) Once TM B has created a breach of the enemy obstacles, TM A becomes the main effort and assaults through the obstacle to seize OBJ BILLY. TM D follows TM A to seize the high ground vic. OBJ DAVE. TM C will follow TM D to seize OBJ Hank to prepare for the counter-attack by the brigade reserve.

e) Consolidation responsibilities vic OBJ JOHNSON are: TM A 6 to 10 o'clock; TM C 10 to 2 o'clock (vic OBJ HANK); TM D 2 to 6 o'clock, and on order TM B TF Reserve. On order, the task force reorients to final ABF positions to defend against possible counterattack. TM B, TF Reserve locates vic grid NP 605450.

2) Fires. Annex E (Fire Support Annex).

a) **PURPOSE:** The purpose of fires during this operation is to screen the task force's movement along AXIS SLASH and during breaching operations with artillery and mortar smoke. We will also use indirect fires to neutralize enemy anti-tank systems and counterattacks, and to suppress enemy armor during our assault of OBJ JOHNSON. Close Air Support (CAS) will be used to neutralize any enemy reserves committed in our sector.

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- b) PRIORITIES: Priority of FA fires is initially to battalion Scouts.

Priority of FA fire goes to Team A once they cross the LD. Once TM C crosses PL SLICE, priority of FA fires goes to Team C and priority of mortar fires goes to Team B. As Team A begins its assault they will receive priority of mortar fires. As TM D moves to seize OBJ Dave, they will receive priority of mortar fires. Upon consolidation Team C will receive priority of FA fires and Team D will receive priority of mortar fires. The transition of priorities of fire will only take effect upon order of the task force FSO.

c) ALLOCATION: Teams that have priority of fires for a particular indirect fires system are allocated one priority target for that system, during that period of the operation. Each team is allocated three targets for planning. Twenty minutes of artillery smoke has been allocated to screen TM A's movement to A-1 and Team B's breaching operation. Ten minutes of artillery smoke is allocated to screen the rest of the Task Force as it moves to its initial ABF positions. Four CAS sorties have been allocated to the task force and will remain under TF control. One radar Critical Friendly Zone (CFZ) is allocated to the task force to protect Team B's breach. There are 24 COPPERHEAD rounds allocated to the brigade, but we are last in priority for their use. Be prepared to employ COPPERHEAD if it becomes available.

d) RESTRICTIONS: The initial CFL is PL PEPSI. Subsequent phase lines are on order CFL. OBJ BILLY, HANK, and OBJ DAVE are Restricted Fire Areas with a restriction of no ICM fires. ACA FRANCISCO, no fires north of San Francisco Railroad, is effective on order. The task force FSO must approve any additional allocations of smoke. The target cut-off time is _____. Changes or modifications will only be accepted in specific situations, on a case by case basis.

- 3) Priority of Intelligence Requirements (PIR):

- a) Locations, dimensions, and types of obstacles located in zone.
- b) Location of dug-in tank positions.
- c) The time, route of march, and location of enemy reserves counterattacking into our zone.

4) Air Defense Operations. Priority is to protection of the breach site, CP, and maneuver forces. Weapons control status is TIGHT. Air defense warning is YELLOW.

5) Engineer. Priority of personnel and equipment effort to mobility, then survivability. Priority of mobility work is to proof and expand the breach sites. Open two lanes in the western portions of the main obstacles. Priority of effort is initially with TM B, on order to TM C. No FASCAM is authorized for this mission.

b. Tasks to Maneuver Units

- 1) TM A (Assault Force).

- a) Be prepared to conduct breaching operations at the breach site.
- b) On order, attack to seize OBJ BILLY.

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- c) On order, occupy ABF A-2.
- d) B/P to become TF Reserve.
- 2) TM B (Breach Force).
 - a) Be prepared to seize OBJ BILLY.
 - b) Breach obstacle vic grid NP 5843.
 - c) O/O become Task Force reserve after the breach.
 - d) B/P to reinforce the perimeter upon consolidation.
- 3) TM C (Support Force).
 - a) On order, follow TM D through the breach.
 - b) On order, attack north to seize OBJ Hank.
 - c) Be prepared to breach vic grid NP 605410 and attack north to seize
OBJ DAVE.
 - d) On order, occupy ABF C-2.
- 4) TM D (Support Force).
 - a) On order, follow TM A through the breach to seize OBJ Dave.
 - b) On order, occupy ABF D-2.
- 5) Scouts.
 - a) Establish a screen along PL Pepsi, effective immediately.
 - b) When TF crosses LD, conduct a detailed area reconnaissance of the
objective area, and establish OPs vic NP634404 and NP570444 to provide surveillance during the
breach and assault phases.
 - c) On order screen forward to PL JOLT.
- 6) Mortars. GSF with Priorities Of Fire.
 - a) Move in the center of the TF box, and establish firing positions vic
NP 605385 (PA 1, AOF 0100).

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b) Once the assault force seizes OBJ JOHNSON follow TM C through the breach, by section, providing continuous fires at all times. Establish firing positions VIC NP 605443(PA 2t AOF 0600).

c. Tasks to Combat Support Units.

1) Fire Support.

a) Close Air Support. TF 2-14 AR has four A-10 CAS sorties armed with MAVERICK missiles and 30mm guns. Priority for use against the brigade reserve and divisional reserves.

b) Chemical Support. (Omitted)

c) Field Artillery.

- (1) Organization for Combat (Supporting 3 BDE).
 - 3-50 FA (155,SP): DS 3 BDE
 - 2-206 FA (155, SP): R 3-50 FA , o/o GS
 - 3/E/333 FA (Q36): Attached 3-50 FA
 - A/23 FA (MLRS): GS
 - E/333 FA (TAB): GS

d) Fire Support Coordination Instructions:

(1) The battalion target number block is AG 2000-2999. Team A will use AG2200-AG2299. Team B will use 2300-2399. Team C will use 2400-2499. Team D will use AG2500-AG2599.

(2) Restricted Fire Areas (RFA) HANK, BILLY, and DAVE , no ICM, effective 031500 JAN 9-.

(3) ACA FRANCISCO, no fires north of SAN FRANCISCO RAILROAD (running from grid NP 580400 to NP640490), effective on order.

(4) Team B FSO report specific location of breach lane ASAP. One Radar Critical Friendly Zone (CFZ) will be established to protect the lane.

2) Air Defense. (omitted)

3) Engineer.

a) Mark lanes after the teams proof them.

b) Guide units through the breach site.

c) Continue the reduction and marking of the obstacle for follow on forces.

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d) Be prepared to transition to the defense upon securing the objective with priority of equipment to survivability, and priority of personnel to counter mobility.

d. Coordinating Instructions.

1) Report the following events:

- a) Report the GPS grid of breach lanes once established.
- b) Enemy counterattack.
- c) Mass surrenders.

2) MOPP level II effective 050545 JAN 19--.

3) ROUTES JAB and HOOK: SP at grid NP563184 for ROUTE JAB and NP563200 for ROUTE HOOK; RP at grid NP 643257 for ROUTE JAB, and NP 626248 for ROUTE HOOK. SP times are as follows: TM C 0600, TM D 0622, TM A 0605, TM B 0627, S-3 and Mortars 0615, command and control 0612, and the TF combat trains along ROUTE HOOK at 0640.

4. SERVICE SUPPORT

a. The combat trains will SP at 0640 and move along RT HOOK and stop vic the NP626270. As our lead combat forces cross PL SLICE, move forward to vic NP 605350 to support the breach. On order, the combat trains will move forward and begin resupply operations at grid NP 595398.

b. Damaged or inoperable vehicles will remain in place; report their location to the battalion CTCP on the A&L net for recovery.

c. Field trains are currently located in the BSA at grid NP 540150.

d. LOGPAC's will push forward to grid NP 595398 on order.

e. Additional requests for supply as per BN TACSOP.

5. COMMAND AND SIGNAL

a. Command.

1) TF CDR with TM A.

2) TF S-3 initially with TM C.

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- 3) Main CP will initially locate at NP 625245.
- b. Signal.
 - 1) Current SOI in effect.
 - 2) Radio listening silence in effect from 050100 JAN to 050700 JAN19__.

ACKNOWLEDGE

HARDTACK
LTC

OFFICIAL:

SMART
S3

Annexes:

- A - Enemy Sketch
- B - Operations overlay
- C - Maneuver Execution Matrix (omitted)
- D - Breach Site Overlay (Omitted)
- E - Fire Support Plan

CLASSIFICATION

APP 1 (FIRE SPT EXEC MATRIX), TO ANNEX E (FIRE SPT), TO OPORD BOLD OX II TF 2-14 3D BDE, 32D AD

PHASE EVENT	TF AT LD	TM C AT PL SLICE	BREACH COMPLETE	TM C ON OBJ HANK	ID EN RESERVE	DEF AGAINST CATK (6)
TF CONTROL (A)	AA BUTCH (1)	MVMT (2)	BREACH (3)	ASSAULT (4)	CONSLIDATIO N	SEAD
TEAM A (B)		CFL - PL PEPSI FA POF 1 FA PRI TGT AG2000 (PRI) AG2002 (PRI)	SEAD CFL-PL JOLT	SEAD MRT POF 1 MRT PRI TGT	SEAD	SEAD AG2005 (PRI)
TEAM B (C)		AG2002 (ALT)	MRT POF 1 MRT PRI TGT			
TEAM C (D)		AG2001 (PRI) AG2000 (ALT)	FA POF 1 FA PRI TFT A4G (PRI) A5G (ALT)		AG2005 (ALT) AG2004 (PRI) AG2003 (ALT)	
TEAM D (E)		AG2002 (ALT)	A5G (PRI) A4G (ALT)	% MRT POF W/ 1 MRT PRI TGT		AG2003 (PRI)
MORTARS (F)	MOVE W/TF	MOVE W/TF TO PA 1	MOVE W/TF	MOVE TO PA 2		
SCOUTS (G)	FA POF 1 FA PRI TGT				AG2003 (PRI) AG2004 (ALT)	
CAS (H)				O/O CAS EN BDE RES		

COMMANDER'S SCHEME FOR FIRES (CRITICAL TASKS):

1. Screen maneuver of friendly forces along axis of advance, and during breaching operations.
2. Suppress enemy direct fire systems on the objective immediately prior to, and during the assault.
3. Neutralize enemy reinforcements into the objective with CAS and indirect fires.

FA ORG FOR CMBT:

3-50 FA (155, SP): DS 3D BDE
 3/E/33 FA (Q-36): ATTCH 3-50 FA
 2-206 FA (155, SP): R 3-50 FA % GS
 A/23 FA (MLRS): GS
 E/33 FA (TAB) (-): GS

MORTAR PSN:

PA 1: NP605385
 AOF: 0100
 PA 2: NP605443
 AOF: 0600

TF CDR ATK GUIDANCE:

DEST: FIRE SPT, LOG

NEUT: AT-5, C2, RSTA

SUPP: ARMOR, ADA

HIGH PAYOFF TGTS:

1. AT-5
2. C2
3. ADA

AMMUNITION:

1. 30 MIN FA SMK (HC)
2. 20 MIN FA SMK (WP)
3. 30 MIN MORTAR SMK (WP)
4. 24 COPPERHEAD (3RD IN BDE PRI)
5. NO FASCAM AVAILABLE

CAS SORTIES/MUNITIONS:

- 4 SORTIES A-10
 - 30MM GUN
 - MAVERICK MSL

FS COORD MEASURES:

1. PLs ARE ON ORDER CFL'S (SEE FSEM)
2. ACA FRANCISCO: NO FIRES NORTH OF SAN FRANCISCO RR, EFF ON ORDER
3. RFA HANK, BILLY AND DAVE, NO ICM, EFF 1500JAN9

COORDINATING INSTRUCTIONS:

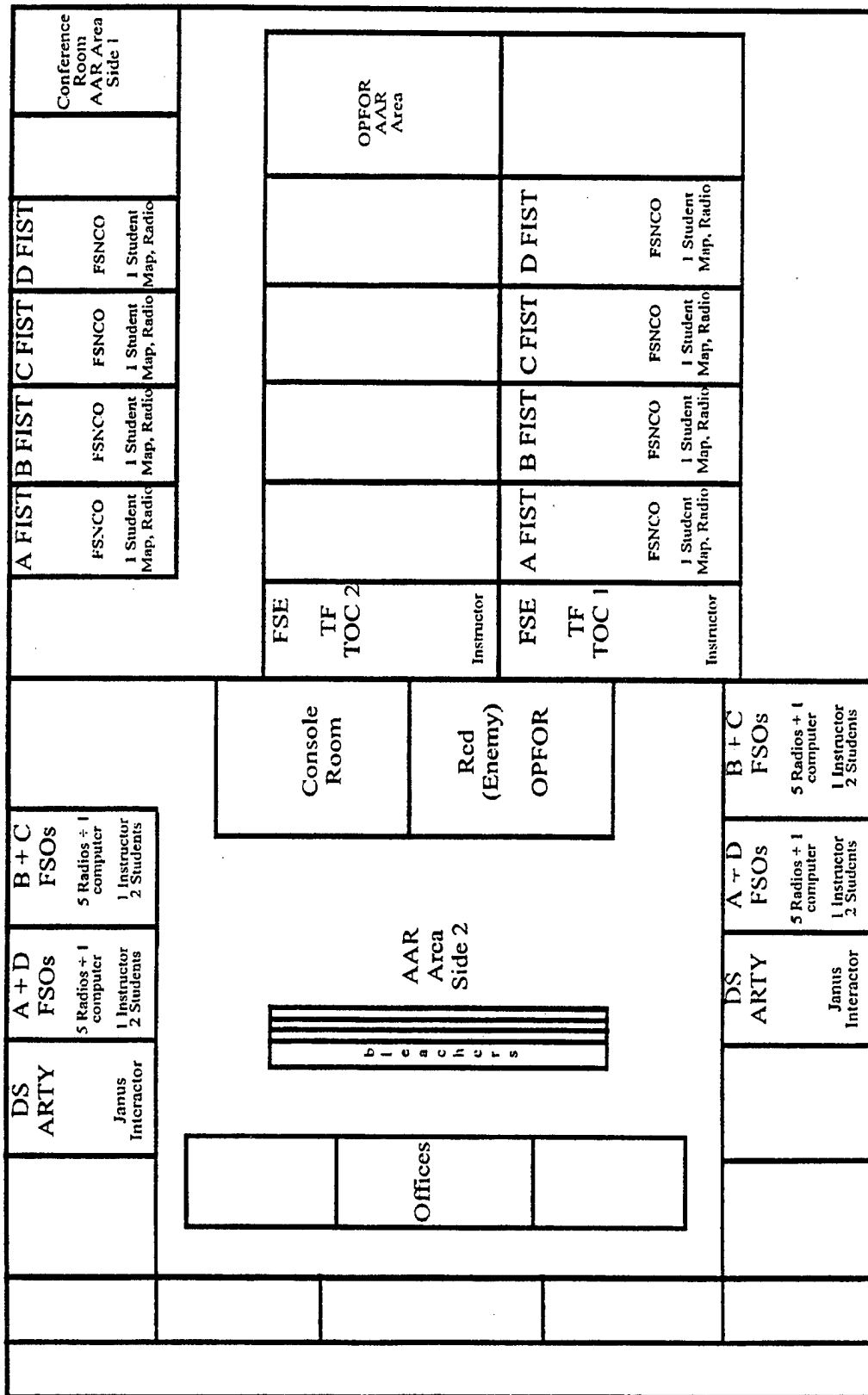
1. CO FSOs are allocated 3 targets for planning.
2. 30 minutes of artillery smoke is allocated to support the TF's movement and for breaching operations. TF FSO must approve any additional allocations of smoke.
3. Target Cut-Off Time is _____. No changes, modifications, or additions will be accepted after this time.
4. Triggers:
 - AG2000 - Lead element crosses PL Fanta
 - AG2001 - TM C at PL Pepsi
 - AG2002 - TM A crosses Bald Ridge Road
 - AG2003 - ID Reserve from Eastern AOA
 - AG2004 - ID Reserve from Northern AOA
 - AG2005 - ID Reserve from Western AOA
 - A4G - When TM C is at PL Slice
 - A5G - Once TM D is set at ABF D-1

APPENDIX C

OVERVIEW OF JANUS SIMULATION FACILITY

JANUS

SIDE 1



APPENDIX D

SELF-RATED PROFICIENCY SURVEY – STUDY 2

SELF-RATED PROFICIENCY SURVEY – STUDY 2

Please use the following scale to rate your perceived proficiency at this moment for each of the items below. Please write the number you feel is accurate for each item on the line to the right of the item,

My proficiency is:

low	somewhat low	average	somewhat high	high
1	2	3	4	5

My proficiency at establishing trigger points is _____

My proficiency at using trigger points when calling for fire is _____

My proficiency at utilizing the high payoff target list is _____

My proficiency at understanding the purpose of designating priority targets is _____

My proficiency at requesting a change in priority of fires is _____

My proficiency at relaying information to the appropriate person in a timely manner throughout the battle is _____

My proficiency at generating SITREPS that paint an accurate picture of the battle (as I can see it from my location) is _____

My proficiency at efficiently shifting fires to destroy, neutralize, or suppress the enemy is _____

My proficiency at recognizing the need to end fire missions once the desired effects have been achieved in the target area or the enemy has moved is _____

My proficiency at recognizing the need to repeat fires on targets when desired effects in the target area have not been achieved and the enemy is still in the target area is _____

My proficiency at using updated information as it is relayed to me is _____

My proficiency at understanding the use of smoke on the battlefield is _____

My proficiency in using the information I have learned in the classroom to prepare a fire support plan is _____

My proficiency at understanding the purpose of designating priority of fires at company level is _____

APPENDIX E

EXAM FOR DEFENSIVE EXERCISE

EXAM FOR DEFENSIVE EXERCISE

***indicates the answer we want student to choose.

Please Circle the correct response for each of the following questions. There is only one right answer. If you feel there are two right answers, choose the better answer of the two.

1. You are the FSO for TM A and have called in fire on target group A3B. The rounds have impacted. The enemy is now stationary at that location but has not been destroyed (i.e., desired effects of neutralization have not been achieved). The FDC has announced rounds complete. What do you do next?
 - a. Transmit "EOM" on target group A3B.
 - *** b. Transmit "Repeat" on target group A3B.
 - c. Do nothing because you expect the artillery to continue firing until you send them "EOM".
 - d. Ignore the enemy in target group A3B. You have already fired on that target and you have other targets to fire.
2. The FDO receives two missions simultaneously. One is a description of a high payoff target; the other is not a high payoff target, but came from an observer who has priority of fires. Which mission gets fired first?
 - *** a. The high payoff target.
 - b. The mission from the observer who has priority of fires.
3. You are the FSO for TM A. Your company has been reduced to 40%. What do you do?
 - a. Retreat.
 - b. Continue to fight.
 - *** c. Report your status to higher headquarters (battalion FSO).
 - d. Fire the FPF.
4. You are the FSO for TM Mech and have called for fire on target group A3B. However, the enemy stops in a hasty defense 500 meters north of the target group. The rounds have impacted in front of the enemy. What do you do?
 - a. Transmit "A3B Repeat" to the FDC.
 - b. Transmit "EOM A3B" to the FDC.
 - c. Transmit "Adjust Fire A3B" to the FDC.
 - *** d. Send "A3B, direction 6400, add 500, Repeat" to the FDC.
5. When a high payoff target is spotted and reported to the TF FSO, what happens?
 - a. Nothing, unless the reporting FSO has priority of fires.
 - b. Reporting team is given priority of fires.
 - c. It is placed in the queue in the order in which it is received for firing.
 - *** d. It is engaged as soon as possible with the appropriate weapon system.

6. You are assigned to initiate group A1B but you realize you cannot see the trigger point for A1B from your location. What should you do?

- a. Send your FSS forward across task force boundaries to get a better view.
- b. Estimate when the enemy might be at A1B and fire it at that time.
- c. Fire the group with WP to see if you can see it.
- *** d. Report to the battalion FSO that you cannot see a trigger point for the target.

7. You are the FSO for TM C and the enemy has moved 3 MRB's into your company's zone of action. TM A has priority of fires. What do you do next?

- a. Transmit a call for fire and let the FDC sort out the missions.
- *** b. Transmit a SITREP and request to the battalion FSO to shift priority of fires to TM C.
- c. Transmit a SITREP to the battalion FSO and hope he instructs TM A to fire on the enemy in your area.
- d. Wait for TM A to see the 3 MRB's and call for fire on them.

8. You are a Company FSO and you do not have priority of fires. Within your sector, you see the Bde high payoff target. What do you do?

- a. Wait for the team who has priority of fires see it and fire on it.
- b. Wait until you have priority of fires and then see if it is still in your sector.
- *** c. Report it to the battalion FSO and ask for permission to fire it.
- d. Transmit a call for fire to the DS Artillery FDC.

9. Name two characteristics of a good trigger point.

- 1. ***Observable_____
- 2. _____
- 3. ***Easily Identifiable_____

10. You are the FSO for TM C and have called for fire on a breach site. You observe two tanks burning and the rest are retreating. What do you do?

- *** a. Report the effects of the rounds in the target area to the TF FSO.
- b. Put smoke on the breach.
- c. Ask for "Adjust Fire" on the target.
- d. Request a "Repeat".

11. You are the FSO for TM D and have observed an enemy reconnaissance element (not a high payoff target) in your sector. TM A has priority of fires. What do you do?

- a. Call directly to the DS Artillery for fire on the target.
- *** b. Transmit a SITREP to the TF FSO.
- c. Ask the TF FSO to shift priority of fires to TM D.
- d. Do nothing until you spot a battalion-sized enemy element or larger.

12. You are a Company FSO and are trying to determine the trigger point for your smoke target to assist your ambush platoon. Which of the following factors will influence the position of your trigger point?

- *** a. Enemy rate of movement, transmission time, time of flight.
- b. Enemy rate of movement, wind speed, time of flight.
- c. Transmission time, wind direction, humidity.
- d. Transmission time, time of flight, wind speed.

APPENDIX F
EXAM FOR OFFENSIVE EXERCISE

EXAM FOR OFFENSIVE EXERCISE

***indicates the answer we want student to choose.

Please circle the correct response for each of the following questions. There is only one right answer. If you feel there are two right answers, choose the better answer of the two.

1. You are responsible to fire a battalion group that will provide suppressive fires for another team conducting a breach. Which of these factors will influence your choice of a trigger point?

- a. Enemy route of march.
- b. Enemy rate of march.
- *** c. Friendly rate of march.
- d. Both a and b.

2. You are the FSO for TM C. You are responsible to fire AB2000 which is a battalion smoke target to screen the breaching elements. After observing the smoke impact, you notice the wind has changed direction and is blowing the smoke 300 meters south of where you need it. What do you do?

- a. Transmit "EOM".
- *** b. Give a correction shifting the smoke 300 meters north.
- c. Transmit a "Repeat".
- d. Continue the breach.

3. The company's lead platoon reported that one of their vehicles has been destroyed by an unseen enemy ambush. What do you do?

- a. Continue your line of march.
- b. Call for a mission on the target.
- *** c. Transmit a SITREP to the TF FSO.
- d. Request resupply in place.

4. You are the TM D FSO. Your lead platoon FO has located an enemy air defense site and reported its location to you. What is this air defense site likely to be:

- *** a. A high payoff target.
- b. A priority target.
- c. Both a and b.
- d. A danger to friendly ADA assets.

5. Name two characteristics of a good trigger point.

1) *** Observable _____

2) *** Easily Identifiable _____

6. Once you are on the objective, you engage an enemy strong point with mortars. You observe the effects to be on target. However, the strong point is still engaging you. What do you do?

- *** a. Transmit "Repeat".
- b. Transmit "EOM".
- c. Continue to advance towards the strong point.
- d. Withdraw.

7. You are the FSO for TM Mech and have just crossed PL SLICE. You are preparing to conduct a joint attack along with TM A against a dug-in enemy position. What do you do next?

- a. Start the attack as soon as you are ready.
- b. Transmit out scouts to ensure the enemy is still in position.
- c. Wait for the TF FSO to call you so you can tell him you are in position.
- *** d. Report that you have crossed PL SLICE and are in position for the attack to the TF FSO.

8. You are the TM D FSO. You wish to engage an air defense site. TM C has priority of fires. What do you do?

- *** a. Report it to the TF FSO and request to fire it.
- b. Transmit a call for fire to the FDC.
- c. Ask the TF FSO to shift priority of fires to TM D.
- d. Wait for TM C to locate the ADA site.

9. You are responsible for initiating a battalion smoke target. You compute the trigger point to be when your tank platoon crosses the dry river bed on the company route of march. Neither you nor any of your FOs will be in position to observe when the tank platoon crosses the trigger point. How will you know when the tank platoon crosses the river bed?

- a. On the Mortar net.
- b. On the FDC net.
- *** c. On the Company Command net.
- d. On the Fire Support net from the TF FSO.

10. You are the FSO for the team assigned to conduct the breach. As you begin the breach, several vehicles are destroyed by an antitank position. You had previously engaged this target with artillery and assumed it to be out of action. What do you do?

- a. Continue the breach, ignoring the antitank position.
- *** b. Re-engage the antitank position with Artillery.
- c. Retreat.
- d. Move the FISTV in front of the friendly tanks to get a better view.

11. You are the FSO for TM C. TM C has just breached a minefield, sustaining heavy damage to equipment and several casualties. Currently, 4 M1's and a FISTV remain. You are at 60% strength of personnel. What do you do?

- *** a. Report current team status to the TF FSO.
- b. Stop for reconstitution.
- c. Continue to move on the enemy without regard for your losses.
- d. Set up a hasty defense.

12. Select the set of items listed below that would likely be identified as high payoff targets.

- a. Road junction, Hind-D, church steeple.
- b. Obstacle system, assembly area, reconnaissance elements.
- c. 2 BMP'S, engineer vehicles, infantry squad.
- *** d. AT-5 (Anti-tank Missile System), command post, ADA weapon system.

APPENDIX G
PROFICIENCY SURVEYS – STUDY 3

PROFICIENCY SURVEYS – STUDY 3

Personal four digit code:

Date:

Side 1 or 2 (Circle One)

Team A B/Mech C D (Circle One)

Position (Circle One)

FSO
FSNCO
FSSpec
RTO
Arty RTO
Mort RTO
Asst TFFSO

Call Sign

SELF-RATED PROFICIENCY SURVEY

Please use the following scale to rate your perceived proficiency at this moment for each of the items below . Please write the number you feel is accurate for each item on the line to the right of the item.

My proficiency is:

low	somewhat low	average	somewhat high	high
1	2	3	4	5

My proficiency at establishing trigger points is _____

My proficiency at using trigger points when calling for fire is _____

My proficiency at understanding the purpose of designating priority targets is _____

My proficiency at requesting a change in priority of fires is _____

My proficiency at relaying information to the appropriate person in a timely manner throughout the battle is _____

My proficiency at generating SITREPS that paint an accurate picture of the battle (as I can see it from my location) _____

My proficiency at efficiently shifting fires to destroy, neutralize, or suppress the enemy is _____

My proficiency at using updated information as it is relayed to me is _____

My proficiency at understanding the use of smoke on the battlefield is _____

My proficiency in using the information I have learned in the classroom to prepare a fire support plan is _____

My proficiency at coordinating fire support in synchronization with maneuver is _____

My proficiency at utilizing the FSEM is _____

My proficiency at delivering a briefing is _____

My proficiency at incorporating my company commander's guidance into my fire support plan is _____

My proficiency in completing essential tasks is _____

APPENDIX H
INSTRUCTOR SURVEYS – STUDY 3

INSTRUCTOR SURVEYS – STUDY 3

Date:

AM or PM (Circle One)

Side 1 or 2 (Circle One)

Team A B C D (Circle One)

Instructor Ratings - Before the Battle

1. Please indicate whether the FSO presented the following items during his brief:

Without Prompting	With Prompting	No
----------------------	-------------------	----

Situation

When orienting the commander, did he correctly state:

- | | | | |
|--|-------|-------|-------|
| a. all known enemy locations? | _____ | _____ | _____ |
| b. friendly unit locations & describe maneuver/FS plan | _____ | _____ | _____ |

Mission:

Did he restate the company commander's mission verbatim?	_____	_____	_____
--	-------	-------	-------

Execution:

Did he correctly:

- | | | | |
|--|-------|-------|-------|
| a. restate company commander guidance for fires? | _____ | _____ | _____ |
| b. state FS assets available? | _____ | _____ | _____ |
| c. state POF, priority targets, and FPF'S? | _____ | _____ | _____ |
| d. state special munitions available? | _____ | _____ | _____ |
| e. state scheme of fires? | _____ | _____ | _____ |

Service Support:

- | | | | |
|---------------------------------------|-------|-------|-------|
| a. Did he have a FS equipment status? | _____ | _____ | _____ |
|---------------------------------------|-------|-------|-------|

Command and Signal:

Did he have:

- | | | | |
|--|-------|-------|-------|
| a. a FS task organization for operation? | _____ | _____ | _____ |
| b. clearance of fire/FO control options? | _____ | _____ | _____ |
| c. a FIST-V employment options/movement plan? | _____ | _____ | _____ |
| d. A FSO/FIST-V location and actions upon loss of the FSO? | _____ | _____ | _____ |

II. Rate the quality of the FSO's brief. Please indicate the percentage of other briefs you heard that were WORSE than this one. Thus, LOW percentages indicate poor performance and HIGH percentages indicate excellent performances.

0 10 20 30 40 50 60 70 80 90 100

INSTRUCTOR RATINGS

Date: _____

AM or PM (Circle One)

Side 1 or 2 (Circle One)

Team A B C D (Circle One)

Instructor Ratings - After the Battle

Please rate the FSO/TM's ability to perform various tasks. Please use this scale when answering the following questions:

poor	fair	average	good	excellent
1	2	3	4	5

1. Rate the overall performance of the FSO/TM in the exercise. _____
2. Rate the effectiveness of the FSO/TM's fire support plan. _____
3. Rate the FSO/TM's execution of the fire support plan. _____
4. Rate the FSO/TM's performance in processing and executing unplanned calls for fire in a timely fashion. _____
5. Rate the FSO/TM's performance in accurately establishing trigger points. _____
6. Rate the FSO/TM's use of trigger points when calling for fire. _____
7. Rate the FSO/TM's performance at updating SITREPS. _____

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13. ABSTRACT (Maximum 200 words) The United States Army Field Artillery School (USAFAS) at Fort Sill, Oklahoma, uses the Janus battle simulation for training officers in fire support operations and battle command decision making. In conjunction with the training exercises, a series of experiments was run to determine the effectiveness of the Janus simulation for training students in the Officer Basic Course (OBC). Course instructors were interviewed to determine the training objectives expected to be met using the Janus simulation. These objectives were measured using both objective and subjective measurement approaches. Objective measures were performance indicators that could be derived from the simulation. Characteristics of the simulation, instructor involvement, and ability of the interactors limited the validity of the objective measures. Subjective measures, obtained using self-report measures from instructors and students, indicated that the Janus simulation exercises, as used in the OBC, were useful in increasing the confidence and proficiency of the students. Results are presented by training objective and measurement approach.					
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